SCIENCE

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SCIENCE IN BRITAIN[1]

By Sir RICHARD GREGORY, Bt., F.R.S.

THE British Association for the Advancement of Science was founded in the year 1831. In the same year the world-renowned naturalist, Charles Darwin, left England in H.M.S. *Beagle* as a member of the famous expedition to the Pacific. Between 1831 and 1836 the expedition surveyed the South American coasts and adjacent islands, including the Galapagos Islands, and also the coasts of Australia and New Zealand. Darwin recorded that the voyage was the most important event in his life and it determined his whole career. The geological and other natural history notes made by him during the voyage, especially along South America, were the basis of most of his later works.

Exactly a century ago, Darwin prepared a short account of the facts observed by him which indicated relationships between different living things and suggested a common line of descent. Also, in the year 1842, was published his great work on "The Structure and Distribution of Coral Reefs," which gave the results of his own observations of coral atolls in the Pacific and Indian Oceans, and threw new light upon their structure. He suggested that cores should be obtained by borings of such reefs in order to discover how deep the coral rock extended below the limit of about thirty fathoms in which the coral organisms can live. The British Association was the first body to set

[1] From the report of the British Association for the Advancement of Science. This is the English text of a broadcast recently prepared by the president of the association for a series of talks on British science given in South American programs of the British Broadcasting Corporation in Spanish and Portuguese. It outlines the peacetime activities of the association, some of which are necessarily in abeyance now; it will therefore interest especially those who have come into contact with the association only during the war period.

such a project on foot, with the result that cores obtained at depths of more than a thousand feet were found to be built up of the remains of coral organisms living near the surface of the ocean.

One of the chief characteristics of the British Association is that of taking the initiative in promoting or undertaking scientific investigations of this kind. This applies also to other movements of national interest to which the association gives its authority and appeals for support. The acquisition and preservation of the house in the village of Downe, Kent, where Darwin lived for forty years and wrote his great work on "The Origin of Species," was the result of such an appeal made at an annual meeting of the association by the president, Sir Arthur Keith. Darwin took up his residence in the house exactly a century ago and died there in 1882. Through the generosity of a distinguished surgeon, Sir Buckston Browne, the house and grounds were purchased in 1927 and transferred to the possession of the British Association, with an endowment towards the maintenance as a national memorial. The chief rooms have in them furniture and objects used by Darwin himself and are decorated to reproduce the surroundings in which he worked. Charles Darwin's home at Downe has thus now become a place of pilgrimage similar in character and contents to the home of George Washington at Mount Vernon, Virginia, and similarly brings thousands of visitors to the shrine.

The British Association differs from other scientific societies in the fact that no professional rank or other technical qualification is required on the part of an applicant for admission to its membership. It is therefore, open not only to scientific students and investigators, but also to any member of the community interested in science. The association does not invade the field marked out by other scientific organizations, but provides common ground on which representatives of them all can meet to discuss methods and results of scientific research and foster public interest in them.

The objects for which the association was constituted are: to give a stronger impulse and a more systematic direction to scientific inquiry; to promote the intercourse of those who cultivate science in different parts of the British Empire with one another and with foreign philosophers; to obtain a more general attention for the objects of science and the removal of any disadvantages of a public kind which impede its progress.

The legislative body of this parliament of science is a general committee of about seven hundred members who have qualified to serve upon it by the publication of contributions to the advancement of science. This committee has similar functions to those of the British Parliament, and it similarly elects the council and officers to act as a cabinet governing the association's affairs.

The association meets annually as a corporate body, and the place of the meeting is decided by the general committee not less than two years in advance. Invitations to meet at particular places are sent to the association by municipal and other authorities; and there are usually several of these awaiting acceptance every year. The average number of membership tickets issued at an annual meeting is above two thousand, but at some meetings the number has been more than twice as great. At every annual meeting many local residents and others not professionally engaged on scientific work become members, and the expenses of the meeting are borne by the local authorities and their supporters. Since the foundation of the association in 1831 meetings have been held in most of the chief cities and towns of Great Britain, as well as in Ireland, Canada, South Africa, Australia and India.

There are now thirteen sections of the association, each with its own president and secretaries, and together they cover all branches of scientific knowledge. The sections meet separately for the consideration of their own special subjects, but two or more sections often meet jointly for the discussion of contributions of common interest. Communications to the various sections relate usually to the position of researches in which the authors are engaged and to problems arising out of them.

Results of new investigations are often announced at the annual meetings and are sometimes of great scientific interest. For example, it was at the annual meeting at Oxford in 1894 that Lord Rayleigh and Sir William Ramsay announced the discovery of a new gas, to which the name argon was given, in the earth's atmosphere. This gas is now widely used to increase the life and efficiency of electric bulb lamps. Another similar gas, neon, afterwards isolated from the air, is used in electric discharge tubes for advertisement and other purposes. The discovery of the existence of the electron, upon which the transmission and reception of electric waves used in all forms of radio communication depend, was announced by Sir Joseph Thomson at the annual meeting of the association in 1897. Five years earlier, Sir Oliver Lodge had given, at the annual meeting, the first demonstration that electric waves could be used for signalling in the Morse code, over a distance of sixty yards, through two internal and one external wall.

At every annual meeting, research committees are appointed to report upon particular subjects and problems of scientific importance. These reports, presented at following meetings, constitute the most influential part of the association's activities. The work of these committees is entirely voluntary, but small financial grants are made to cover essential expenses. Fully one half of the total receipts for membership tickets

for annual meetings have been devoted to scientific investigations by means of such grants, the total amount being about £1,000 a year. The association received no assistance from public funds, and possesses, therefore, the freedom of service highly cherished by most British scientists.

Through its research committees, the association has initiated many new scientific movements which have afterwards been maintained from public and other funds. The Kew Observatory, now under the British Meteorological Office, and one of the most renowned institutions in the world, was placed at the disposal of the association by Queen Victoria just a century ago. The government at that time had decided no longer to maintain the building as an observatory and museum, for which purposes it had been built by King George III. In spite of its slender financial resources, the responsibility for maintaining the observatory as a center of work in meteorology, terrestrial magnetism and electricity, and related subjects, was undertaken by a committee of the association, and the results of this decision have influenced the progress of geophysical knowledge everywhere. Between 1843 and 1872 the association made grants to the Kew Observatory amounting to £12,300, by far the largest total to any of its committees at any time in its history, and the whole of this amount was derived from the membership subscriptions at annual meetings.

Another example of work of international value is that carried out by British Association committees on electrical standards. Eighty years ago there were no generally recognized units or standards for the measurement of electrical resistance, current, electromotive force, quantity, capacity and similar values. The association undertook investigations of this subject over a long period of years, and the standards specified and constructed by its committees have become international, thus assisting trade and manufacture everywhere. In all the principal countries of the world the same electrical units and standards are adopted. The British Association was responsible for the institution of this uniform system.

Reports of this kind, with the inaugural address given annually by the president of the association, and the addresses delivered to the separate sections by their respective presidents, are now published in a quarterly review with the title, "The Advancement of Science," instead of a bulky annual volume. The current issue of this review includes all the papers read at the Conference on Science and World Order held in London in September of last year. The conference was arranged by the association's Divisions for the Social and International Relations of Science, and was attended by distinguished men of science and other citizens of more than twenty nationalities. This was the first occasion upon which representatives of science, administration and government met together to consider problems of the adjustment of progressive scientific knowledge to social action.

The division was established in 1938 to further the objective study of contacts of science with social conditions, and to promote the welfare of human communities by international understanding of them. It is empowered to hold meetings or conferences at any time with the view of attaining these objects; and it represents the response of the association for cooperation in the shaping of a social structure worthy of the powers which science has given to civilized communities. When General Smuts was president of the association at the Centenary Meeting in 1931, he pointed out in his presidential address on "The Scientific World-Picture of To-day" that "One of the greatest tasks before the human race will be to link up science with ethical values, and thus to remove dangers threatening our future." Every president since then has referred in his inaugural address to the social implications of science and the need for effective recognition of them. By the establishment of its new division the association has adapted itself to the needs of the times, and provided a new cooperative federation of thought and action on contacts of science with social and international affairs.

Every association for the advancement of science, constituted like the British Association and including not only scientific workers but also members of the community engaged in other pursuits, can take part in this development of its fields of activity. Freedom from any sort of political influence or domination is a characteristic of British scientific societies and is essential for the impartial study of social and international problems. Since the British Association was founded, similar bodies have come into existence in the United States, Australia, New Zealand, South Africa and other countries, and all of them possess the spirit of cooperation for the increase of knowledge and the service of mankind.

Meetings of the association outside Great Britain have always stimulated interest in science and its relationships to the community. There is nothing in the constitution of the association to prevent such meetings being held outside the British Commonwealth, or for delegates to be sent to a conference in any country. The expanded outlook represented in the new Division for the Social and International Relations of Science can give high public significance, as well as scientific authority, to such a meeting anywhere in the world.

CORRESPONDENCE IN REGARD TO THE CENSORSHIP OF SCIENTIFIC JOURNALS

LETTER FROM J. MCKEEN CATTELL, EDITOR OF SCIENCE, TO COLONEL W. PRESTON CORDERMAN, CHIEF POSTAL CENSOR, WRITTEN FROM LANCASTER, PENNSYLVANIA, JUNE 27, 1942

I SHALL be under obligations to you if you will give me some information concerning the censorship of scientific journals. I am and have been for forty-six years editor of SCIENCE, a weekly journal devoted to the advancement of science. It is the official organ of the American Association for the Advancement of Science, with over twenty-three thousand members, including nearly all those in the United States who are engaged in scientific research.

SCIENCE is made up each week on Tuesday, the copies are printed on Wednesday and Thursday, and are mailed on Thursday evening, the day of publication being Friday.

In accordance with instructions from your office, the pages of the issue for June 19 were sent to you on June 16, which was the earliest possible date. You returned the pages on June 19; they were received on June 20. It was necessary, of course, to print the journal before receiving the proofs from your office, and the copies were mailed as usual to subscribers in the United States and Canada on June 18. Copies for foreign countries were held pending your approval.

You have not censored any part of the editorial pages, but you have censored three notes printed in the supplement among the advertising pages. This is syndicated material, supplied to SCIENCE by Science Service, Washington, D. C., and had all been printed in other journals. Two of the erasures (one of three words) concern matters of health which the Advisory Committee on Scientific Publications of the National Research Council has decided should not be suppressed.

Now what are your instructions in regard to the copies for foreign subscribers? We can not possibly reprint the number with these unimportant omissions. SCIENCE, as you will note, goes to four hundred and sixty-one subscribers in sixty-one foreign countries. It is perhaps the most influential list of subscribers in foreign countries of any American magazine, going to libraries and leading scientific men. Shall we black out the pages that have been censored by your office before mailing the copies? This is possible, but by no means desirable. Shall we write to the subscribers in foreign countries stating that, owing to the censorship in this country, we are unable to mail SCIENCE to them for the duration of the war? Would it not be most unfortunate for us to make this admission? I receive regularly the daily *Times* from London and a number of weekly and monthly journals, including *Nature* (the field of which corresponds with SCIENCE) the *British Medical Journal*, the *Lancet* and others. There is no indication that these journals have been censored in England.

There is enclosed a copy of a letter which I have just written to the chairman of the Advisory Committee on Scientific Publications of the National Research Council, which acts for the Government. You will note from the concluding paragraph that in the war of 1917 the Surgeon General and the Secretary of War ruled that there should be no suppression of a life-saving discovery on the ground that the enemy could also make use of it.

I trust you will give this matter your personal attention, for the advancement of science is essential to national welfare and to the prosecution of the war.

LETTER FROM J. MCKEEN CATTELL TO PROFESSOR LUTHER P. EISENHART, NATIONAL RESEARCH COUNCIL, JUNE 25, 1942

On May 8, I addressed to each of the referees in the medical sciences, of whose appointment you had informed me, a letter which read:

> Professor Eisenhart, chairman of the advisory committee on scientific publications of the National Research Council, informs me, as editor of SCIENCE, that a committee to consider developments of consequence in the present war has been formed in the field of the medical sciences.
>
> You are the referee in . . . and I beg you to tell me what kind of articles should be submitted to you before publication. Is it planned to prevent the publication in scientific journals of information that may promote health or limit disease among the people in the countries with which we are at war?

I have now received answers from each of the ten referees. They agree that information should not be suppressed that may promote health or limit disease among the people in the countries with which we are at war. I take it for granted that this would include methods for checking the spread of typhus or more speedy healing of wounds.

Two of the referees make statements, however, that seem to be inconsistent with this policy, or, indeed, with the general tenor of their own letters. One of them writes that articles "directed to the treatment of gas casualties should all be submitted to the appropriate referee." Another writes, "Suppose you reviewed a paper containing material on a new sulfonamide which seemed to be completely non-toxic and much more effective in the control of infections than any

hitherto known. Such a paper would be reviewed to see whether the material in it should be kept confidential until the end of the war."

This latter referee would doubtless have delayed publication of an article on penicillin which was submitted by the author to the Committee on Medical Research of the Office of Scientific Research and Development. They requested him not to send it to SCIENCE, but four months later, after *Nature* had published articles on the subject, wrote to the author that he might print it. It seems to me that SCIENCE is as competent as *Nature* to decide what should or should not be printed.

You have appointed distinguished referees in the medical sciences, and I shall appreciate any advice that they are willing to give. I understand, however, that this is only advice and that there is no intention of using "es ist verboten" methods. Otherwise, I should need to know on what authority they are acting. Unless superseded by higher authority, SCIENCE will follow the decision of the Surgeon General and the Secretary of War in the war of 1917. This is given in a letter from Welch printed in the biography recently published by the Flexners. C. G. Bull had developed an antitoxin for Welch's gas bacillus which was being very destructive on the Western front. In June, 1917, Welch wrote:

> Gorgas is entirely opposed on general principles to withholding the publication of Bull's discoveries, but he wished me to lay the matter before the Secretary of War, so we both saw Secretary Baker. The Secretary took at once the humane view and said that we should not consider for a moment holding back such a life-saving discovery on the ground that the enemy could also make use of it. I was very glad that both the Secretary and the Surgeon General without any hesitation took this position.

LETTER FROM COLONEL W. PRESTON CORDERMAN TO J. MCKEEN CATTELL, JUNE 30, 1942

Thank you for submitting for our interested consideration problems troubling you concerning the censorship of scientific journals scheduled for export from the United States.

Your attention is directed to the fact that the proofs of your publication are examined by the Technical Data License Division of the Board of Economic Warfare. This Division, as a service to the Office of Censorship, examines technical and professional data which is to be exported from the United States. We fully understand your concern over the delay in the return of your proofs from that Division, and will do all we can to have them examined as quickly as possible.

The Technical Data License Division is authorized to order deletion or excision of any information which may be of use to the enemy. Examiners in the Division believe that the material marked for deletion in your June 19 issue would be of aid to the enemy. The reasoning of the examiners is set forth as follows:

1. The deletion of references to indium, relating to a newly discovered process to provide a safety lining for lead shaving cream and toothpaste tubes. They believe that this new discovery should be kept from the enemy, who, if they learned of it, could turn it to their use.

2. The article explaining the use of vitamin C in preventing heat cramps and heat prostration. It is believed that this information in the hands of our armed forces would give them an advantage over the enemy, particularly in desert warfare where heat prostration and heat cramps are common. If we know how to prevent such disorders and the enemy does not, we certainly have an advantage over our opponents.

3. The deletion of the words, "containing calcium polysulfide," from a story explaining use of this chemical in spraying walls of mines to prevent mercury poisoning. If the enemy is troubled with mercury poisoning in their mines, they could use to advantage a chemical of this nature, whereas, if they do not have this knowledge, their production might be affected and the advantage would be ours.

We are in accord with the ruling of the Technical Data License Division and, therefore, request that regulations covering the export of technical and scientific information be complied with. The June 19 issue of SCIENCE may be exported after excision of the objectionable portions which were marked on the proofs returned to you by the Technical Data License Division.

We do not advise that you write your foreign subscribers stating that, "owing to censorship in this country," you are unable to mail your magazine outside the United States, inasmuch as that is not a correct statement. Your magazine may be mailed to points outside the country so long as you comply with the regulations relating to their contents. As for the scientific journals printed in England, they probably are censored prior to publication, following the same procedure as that in force in the United States.

We are not familiar with any regulation promulgated after the beginning of this war, which makes blanket approval of the policy that there should be no suppression of a life-saving discovery on the ground that the enemy could also make use of it.

We were unsuccessful in attempting to contact Prof. Arthur B. Eisenhart, of the National Research Council, to whom you refer. We shall confer with Professor Eisenhart to determine the basis on which the Council issues regulations relating to the export of technical and scientific information.

Thank you for bringing these matters to our attention. Your patriotic cooperation in the future will be greatly appreciated.

LETTER FROM J. MCKEEN CATTELL TO COLONEL W. PRESTON CORDERMAN, JULY 8, 1942

Please let me thank you for your courteous letter of June 27 in regard to the censorship of scientific publications. We need, however, further information.

The copies of SCIENCE for June 19 and 26 and July 3 have been mailed as usual to some 14,000 subscribers in the United States and Canada. 461 copies have been held for foreign subscribers, pending instructions from you.

The copy of June 19 was released by your censor after three minor elisions. These were all in the syndicated notes supplied by Science Service and had already been printed in many newspapers. They were all concerned with matters of health (one but three words in length) which should not have been censored by a competent authority; the censorship would probably not be upheld if an appeal were made to a higher authority. Please let me know to whom such an appeal should be made. Please also send me a copy of the executive order of December 19, No. 8988 under which your censorship is acting.

The number of SCIENCE for June 19 had been printed when your report was received; it is not feasible to print a new edition for foreign subscribers with these elisions. The cost would be large and it would be unethical for a journal to print one edition for the United States and one for foreign subscribers without an explanation of the situation.

No report has as yet been received from the censor on the page proofs of the issues of June 26 and July 3 and 10. It is impossible to delay the publication of a weekly journal; so as stated above, the copies for foreign subscribers are being held until instructions are received from you.

Foreign subscribers will doubtless complain of not receiving the copies of these numbers for which they have paid. Please inform us what should be written to them. I wish that you would consult the Department of State to learn what their attitude would be toward forbidding the sending to foreign nations, especially Mexico, Cuba and South America, of a journal such as SCIENCE.

SCIENCE has, of course, refrained from printing any material concerning improvements in explosives or poison gas or any other matter that might promote the efficiency of the armies of the enemy. But it will be a tragedy if American scientific journals are forbidden to publish information that might promote health or limit disease among the people of the countries with which we are at war. It has always been the fine tradition of the medical profession that a physician will do all he can to save lives, even of criminals. It would be appalling if in a war intended to promote freedom and international goodwill, the publication were prohibited of articles on evidence of medical knowledge.

To withhold publication of information that might lead to the promotion of health or the limitation of disease would be a betrayal of the ethics of medical men handed down from past generations. The government now needs 50,000 physicians for the Army. What would they think if it were known to them that such action had been taken; they would be ashamed to meet their colleagues of the allied nations. As I have told you, in the war of 1917 the Surgeon General and the Secretary of War ruled that "We should not consider for a moment holding back a life-saving discovery on the ground that the enemy could also make use of it."

LETTER FROM J. MCKEEN CATTELL TO COLONEL W. PRESTON CORDERMAN, JULY 9, 1942

Since writing to you yesterday, July 8, we have received a notice from the censor releasing for mailing abroad the issue of SCIENCE for June 26. Copies were prepared for mailing in accordance with your instructions, but to-day, July 9, Mr. Kreider, superintendent of mails at Lancaster, decided after consultation that the copies of SCIENCE could not be accepted without open ends in accordance with your specifications, as in this form they would be first class mail. Copies that are now wrapped and stamped in the bindery must be taken from the wrappers and the wrappers sent to Washington for redemption of postage paid.

We trust that after my letters of June 27 and July 8, you will release for mailing the issue of June 19. I have received from Dr. Luther P. Eisenhart, chairman of the Advisory Committee on Scientific Publications of the National Research Council, acting for the Government, a letter dated June 2 in which he writes: "It is not the intent to withhold publication of advances in medical knowledge which would be of wide-spread value in the treatment of war injuries and the control and treatment of disease." This decision would, of course, permit the publication of the unimportant notes that you have censored in the issue of June 19.

You will note that we have conflicting instructions from government agencies, both in regard to what can be printed in SCIENCE and under what condition the copies can be mailed abroad. I trust that you will agree with me that national efficiency is seriously impaired under such circumstances.

SCIENCE, as you know, is a weekly journal of the highest standing, the property and official organ of the American Association for the Advancement of Science. It was established by Thomas Edison sixty years ago;

was later taken over by Graham Bell, and has had the cooperation of our leading men of science, whose work is so essential to the national welfare. They would not countenance publication of anything that was not in the interest of the nation. Are they not more competent to judge than any one in your office? I trust that you will give us permission to mail copies of SCIENCE without requiring censorship of each issue in your office. This causes delays and interference with the regular publication of a journal useful for national efficiency and welfare.

LETTER FROM MAJOR N. V. CARLSON, ACTING CHIEF POSTAL CENSOR, TO J. MCKEEN CATTELL, JULY 14, 1942

Your letter of July 8, 1942, has been referred to me for consideration and reply. Attached is a copy of Executive Order 8985, although in your letter you referred to the order number as being 8988. It is thought, however, that you had in mind the executive order establishing censorship.

Concerning your question as to possible appeal, it is assumed you are referring to a Board of Appeals which might supersede the action of the examiner of technical data. There is no such Appellate Board functioning. All professional and technical data material is reviewed by the Technical Data Division of the Board of Economic Warfare. Material other than technical data is reviewed by the Office of Censorship. The action taken by both of these agencies is final. However, we have no desire to be arbitrary in our censorship action and will be glad to discuss your problems with you at any time. There is no change in our position regarding the deletions which must be made before your publication is exported.

We have investigated the delay of which you complain in handling proofs of SCIENCE, and find from the Board of Economic Warfare, to which they were sent, that the June 26 issue was received on Saturday, July 4, approved on Monday, July 6, and mailed to you the following day. The July 3 issue also was received July 4, approved July 7, and mailed July 8. The July 10 issue was received July 8, but was not accompanied by an application for license, according to the Board of Economic Warfare.

The general question of precensorship of medical publications is being studied and we soon shall be able to provide a suggested code of practices which may be helpful in avoiding material which is objectionable by censorship standards. Any form of censorship is bound to be restrictive, but in the interest of the war effort this temporary expedient is necessary.

LETTER FROM MAJOR N. V. CARLSON TO J. MCKEEN CATTELL, JULY 14, 1942

While we appreciate the contribution your magazine is making in its field, we nevertheless are unable to grant your request that it be permitted to mail copies abroad without censorship. As stated in our letter of yesterday, in answer to your prior communication, wartime conditions require such examination.

I note that you quote Dr. Luther P. Eisenhart's letter of July 2 in which he stated, "In general, it is not the intent to withhold publication of advances in medical knowledge which would be of widespread value in the treatment of war injuries and the control and treatment of disease." Dr. Eisenhart also said, "Only in instances in which publication would result in military advantage to the enemy is the withholding of scientific papers from publication advisable." We agree with that premise as completely stated.

The National Research Council is a purely advisory organization insofar as scientific publications are concerned and, as you know, has experts available for your consultation and advice. The censorship function, however, does not fall within the field of the council, which I am sure does not agree with your interpretation that it is issuing "conflicting instructions" on material which may be exported.

Insofar as the question of post office regulations raised in your letter of July 8 is concerned, Postal Censorship requires no particular type of wrappers for your publication. The only requirement is that the technical data license be stamped prominently on the outside of the wrapper.

If the publication does not have a license, the copies will be returned to the sender.

EXECUTIVE ORDER
8985

ESTABLISHING THE OFFICE OF CENSORSHIP AND PRESCRIBING ITS FUNCTIONS AND DUTIES

By virtue of the authority vested in me by the Constitution and the statutes of the United States, and particularly by section 303, Title III of the act of December 18, 1941, Public Law 354, 77th Congress, 1st Session, and deeming that the public safety demands it, I hereby order as follows:

1. There is hereby established the Office of Censorship, at the head of which shall be a Director of Censorship. The Director of Censorship shall cause to be censored, in his absolute discretion, communications by mail, cable, radio, or other means of transmission passing between the United States and any foreign country or which may be carried by any vessel or other means of transportation touching at any port, place, or Territory of the United States and bound to or from any foreign country, in accordance with such rules and regulations as the President shall from time to time prescribe. The establishment of rules and regulations in addition to the provisions of this

order shall not be a condition to the exercise of the powers herein granted or the censorship by this order directed. The scope of this order shall include all foreign countries except such as may hereafter be expressly excluded by regulation.

2. There is hereby created a Censorship Policy Board, which shall consist of the Vice-President of the United States, the Secretary of the Treasury, the Secretary of War, the Attorney General, the Postmaster General, the Secretary of the Navy, the Director of the Office of Government Reports, and the Director of the Office of Facts and Figures. The Postmaster General shall act as Chairman of the Board. The Censorship Policy Board shall advise the Director of Censorship with respect to policy and the coordination and integration of the censorship herein directed.

3. The Director of Censorship shall establish a Censorship Operating Board, which shall consist of representatives of such departments and agencies of the Government as the Director shall specify. Each representative shall be designated by the head of the department or agency which he represents. The Censorship Operating Board shall, under the supervision of the Director, perform such duties with respect to operations as the Director shall determine.

4. The Director of Censorship is authorized to take all such measures as may be necessary or expedient to administer the powers hereby conferred, and, in addition to the utilization of existing personnel of any department or agency available therefor, to employ, or authorize the employment of, such additional personnel as he may deem requisite.

5. As used in this order the term "United States" shall be construed to include the Territories and possessions of the United States, including the Philippine Islands.

THE WHITE HOUSE,
DECEMBER 19, 1941

No. 8985

LETTER FROM J. MCKEEN CATTELL TO MAJOR N. V. CARLSON, JULY 17, 1942

Please let me acknowledge the receipt of your two letters, both dated July 14. You also sent me the executive order, for which I asked, establishing the Office of Censorship and prescribing its functions and powers. This executive order empowers the Office of Censorship to censor "communications by mail, cable, radio and other means of transmission passing between the United States and any foreign country." It also creates a censorship policy board consisting of the Vice President of the United States and other officers of the Government. It apparently does not refer in any way to the censorship of periodical publications. You tell me that action taken by your office is final and that there can be no appeal. Surely there can be an appeal to the Censorship Policy Board and also to the courts. It seems rather futile to refer you to the first article of the Bill of Rights, which provides that there shall be no suppression of freedom of the press. If the Constitution seems to be violated, there can be an appeal all the way to the Supreme Court of the United States.

I have, however, no wish to discuss matters that should be taken up by the American Association for the Advancement of Science, The American Medical Association, the Publishers' Association and other bodies, for your rulings concern not only SCIENCE but all publications of the country.

I must, however, attend to the problems that you raise concerning SCIENCE. Your office, in instructions dated March 18, read "After the license is granted, each copy must be wrapped without open ends." Now on July 14 you write: "Postal censorship requires no particular type of wrappers for your publication." How do you reconcile these conflicting instructions? If a number of SCIENCE has not been censored, which has happened just once, you send us a license number to send 461 copies to foreign subscribers, each of which must be signed individually. What is to be done about other copies that should be sent abroad? We must fill special orders, supply copies lost in the mails, and we always send a number of copies to contributors, many of whom reside abroad. How can these copies be sent?

The pages of the issue of SCIENCE for July 3 were sent to you in duplicate on June 30. You state that they were received on July 4, approved on July 7 and mailed on July 8. Every issue of SCIENCE has been published on Fridays without exception, so far as I remember, during the more than forty-six years that I have edited the journal. You surely could not have wanted us to hold up the printing of SCIENCE for some fourteen thousand subscribers in the United States until the pages had been censored after a delay of ten days. When we received the censored sheets, they contained exactly one elision as follows:

A new sulfa drug has been announced by Sharp and Dohme. It is succinyl sulfathiazidine, which the firm has released under the trade name, Sulfasuzidine. Studies in the laboratory and with patients have shown that it is active against dysentery and other intestinal tract germs and may therefore be effective in preventing infection following operations within the abdomen. It is also claimed that it cures carriers of dysentery germs.

This note was printed with other syndicated material sent to us by Science Service, which had been distributed to newspapers from Maine to California. It should not, in any case, have been censored, for it referred to an alleged advance in medical science which

you yourself write should not be suppressed "unless it would result in military advantage to the enemy." Now what shall we do with the 461 copies of SCIENCE that we are holding for foreign subscribers? Please answer this question definitely. Please also tell me what should be written to foreign subscribers who have not received their copies of SCIENCE on account of the censorship.

I shall take it for granted, unless you write to me to the contrary, that our correspondence may be shown to others and published in SCIENCE, should that seem to me to be in the interest of science and the nation.

LETTER FROM COLONEL W. PRESTON CORDERMAN TO J. MCKEEN CATTELL, JULY 21, 1942

In order to avoid any further confusion concerning the jurisdiction of Postal Censorship, we reiterate that Postal Censorship is not concerned with publications distributed within the continental limits of the United States. However, Postal Censorship is charged with the responsibility of examining publications and communications which are placed in the international mails for export, and the suppression of any material which would be of aid to the enemy and injurious to the welfare of the United States and Allied Nations.

Thus, we believe you will understand, the duties of Postal Censorship include safeguarding scientific and technical information which would be of military value to the enemy. It was the considered opinion of the examiners of the Technical Data License Division of the Board of Economic Warfare that the articles ordered deleted from your publication would be of military value to the enemy. Your publication received an export license with a provision that the objectionable material be deleted before the magazines were placed in the mails for export.

Again we state that Postal Censorship has no objection to the mailing of SCIENCE to foreign subscribers provided the war-time restrictions of censorship are complied with and that excisions of objectionable material noted in the licenses are made prior to international mailing. This is not an arbitrary rule applied only to SCIENCE, but is a principle that is adhered to by all publications containing technical, scientific and professional data, which are exported.

Our letter of July 14 informed you that for your magazine no "special type of wrapper" need be used. The only requirement in this respect is that the Technical Data License be placed in a prominent position on the front of the wrappers.

You may send the 461 copies of your publication to foreign subscribers provided objectionable material is deleted and the export license is placed on the wrappers. Copies of every issue of your publication may be mailed to foreign subscribers and contributors provided those issues are licensed and provisions of the license are complied with.

Your cooperation in aiding the purpose of censorship will be greatly appreciated. Naturally, we have no objection to your publication of our correspondence if you feel a useful purpose will be served by your so doing.

OBITUARY

WADE HAMPTON BROWN

WADE HAMPTON BROWN died at Rice Lake, Wisconsin, on August 4, 1942. His sudden death terminated a career of original thought and pioneer research of such caliber and scope as to render premature any present attempt to appreciate or evaluate his position in American medicine.

Dr. Brown was born in Sparta, Georgia, on October 18, 1878. He received his bachelor's degree from the University of Nashville in 1899 and his degree in medicine from Johns Hopkins in 1907. He instructed in pathology at the University of Virginia and at the University of Wisconsin until 1911, when he was made professor of pathology at the University of North Carolina. His interest in education began in premedical years as a teacher in the rural schools of Texas and was maintained throughout his life, but an opportunity to devote full time to research offered broader fields for his abilities and in 1913 he began his long association with the Rockefeller Institute for Medical Research. He was made a full member of the scientific staff in 1922 and continued active research, first in New York and later in Princeton, throughout the remainder of his life.

His early work was concerned with pathological pigmentations and it is a commentary on his ability that his original observations still hold despite the introduction of new and refined techniques. His research in experimental syphilis, the chemotherapy of trypanosome and spirochete infections and cancer were of profound influence. He contributed much to the knowledge of the biology of syphilis, played a dominant role in the elaboration of tryparsamide and discovered and successfully transplanted the rabbit tumor which now bears his name. However, the greater and more fundamental significance of this work is referable to coincident observations on animal behavior which prompted his major undertaking, the study of constitution and environment in relation to disease.

With the exception of preliminary observations reported in a Harvey Lecture in 1929, the results of

this study remain unpublished and the work is known only by his intimate laboratory associates. It was Dr. Brown's plan to start the organization and publication of the material this fall, and his untimely death deprives medicine of basic contributions. It is essential that some arrangement be made to organize and report the work, for its implications from the point of view of human constitution and the inheritance of disease types are revolutionary and demand a reconsideration of fundamental tenets in genetics and pathology.

Dr. Brown's interest was focused on the relationship borne by constitutional factors to disease susceptibility, and his natural abilities combined with great patience and an unlimited capacity for work rendered him particularly fit to undertake the problem. His observational powers were developed to an unusual degree and his eyes and fingertips sufficed for laboratory equipment. The last thirteen years were spent in intimate contact with his animals and he was able to tell accurately the remote ancestry of any particular rabbit from its physical conformation and habits. Moreover, in the majority of cases, he could foretell the ultimate fate of an animal on a basis of past history and pedigree. His patience exceeded the patience of Job, and the constitutional project was undertaken with the full knowledge that several generations of research workers would be required to finish the experiments he began. His capacity for work was also proverbial. His day began at 9 and rarely terminated before midnight. No task was too arduous for him if a grain of knowledge could be extracted from its performance. He had great sympathy for his technicians and helpers but hesitated to relinquish any phase of the work, however menial, for fear that essential data should be misjudged or lost through careless observation.

He possessed a broad sense of humor and a ready wit and his vast knowledge of public as well as of scientific affairs made him a brilliant conversationalist. A remarkable ability to organize and present a complex subject without forewarning or to clarify a confounded situation with a concise and penetrating analysis made his discussions and opinions sought after and remembered. His advice and time were always at the disposal of any one in need and his concern was not altered by the status or problem of the petitioner.

Dr. Brown was a gentleman in an almost forgotten sense of the word. His old-fashioned courtesy, consideration and tolerance, his great interest in everything and everybody and his unfailing friendliness set him apart, and his memory will be inspiration and refreshment to all who knew him.

HARRY S. N. GREENE

DEATHS AND MEMORIALS

DR. STEPHEN WALTER RANSON, professor of neurology and director of the Neurological Institute of the Medical School of Northwestern University, died on August 30 at the age of sixty-two years.

MARCUS STULTS FARR, associate professor emeritus of geology and paleontology of Princeton University, died on August 27 at the age of seventy-two years. He had been a member of the faculty for forty years.

DR. HOWARD CHESTER PETERS, since 1937 instructor in the department of physiology of the University of Tennessee, died on July 13 at the age of thirty-three years.

THE Lake County, Indiana, Medical Society has established the Oberlin Award in memory of the late Dr. Thomas W. Oberlin, of Hammond, one of its charter members. It will be presented each year to a Lake County citizen or institution making the greatest contribution to the health of the people of Lake County. The award consists of a plaque with the following inscription: "Presented by the Lake County Medical Society in recognition of significant contributions to the health and consequent welfare, security and happiness of the people of Lake County."

ACCORDING to the *Journal* of the American Medical Association, a tablet was unveiled at St. Anthony, Newfoundland, on August 4, to commemorate the fiftieth anniversary of the landing of the late Dr. Wilfred Grenfell on the coast of Labrador. Sir Wilfred established the mission in Labrador in 1892. Since his death on October 9, 1940, the activities of the mission have been carried on under the direction of Dr. Charles S. Curtis, St. Anthony. During the fifty years of Sir Wilfred's missionary work five hospitals have been established there, five nursing stations, two boarding schools, one day school and children's home, social services to improve the lot of the coast people, two hospital ships and a supply ship. The inscription on the new tablet reads "In gratitude to God for the Labrador Doctor."

SCIENTIFIC EVENTS

MILITARY TRAINING AT THE UNIVERSITY OF MICHIGAN

TRAINING leading to an officer's commission in the Navy or Army is available at the University of Michigan to physically fit male students through the Naval Reserve Officers' Training Corps and the Army Reserve Officers' Training Corps.

Enrolment in either of the R.O.T.C. programs is on

a voluntary basis, limited by the quotas fixed for the university by the War and Navy Departments. The Naval R.O.T.C. unit, which is starting its third year, has a quota of 250 students, while the Army R.O.T.C., which has been in existence since 1919, can accept 1,100 for basic training and 370 for advanced training.

Instruction provided by the two programs is designed to promote qualities of leadership as well as to impart essential information in regard to military and naval affairs. Both units are an integral part of the university, and academic credit is given to students taking the work. The Navy and Army officers assigned to duty at the university are listed as members of the faculty.

The Naval R.O.T.C. unit, known as the department of naval science and tactics, is under the direction of Captain R. E. Cassidy. Freshmen are admitted only at the start of the fall term in October. A physical examination, similar to that given at the Annapolis Naval Academy, must be passed. A general intelligence test also is given to aid the Naval R.O.T.C. officers in selecting the most promising freshmen from those who make application for admittance. Qualities of character, scholastic standing, age, potential qualities of aptitude, force, honesty, integrity, leadership and loyalty also are considered.

The course of training given by the Naval R.O.T.C. provides the student with a knowledge of seamanship, ordnance, gunnery, engineering, electricity, communications, military law and navigation. Uniforms are provided by the Government and certain compensation is paid to students during the last two years of the course. Enlistment in a special section of the Navy's V-1 program brings exemption from selective service for members of the Naval R.O.T.C.

Successful completion of a four-year course and one sea cruise of approximately four weeks on a naval vessel will qualify the student for a commission as ensign, United States Naval Reserve, or as second lieutenant, United States Marine Corps, provided he also receives a degree from the university.

The Army R.O.T.C., known as the Department of Military Science and Tactics, is under the direction of Colonel W. A. Ganoe. Any physically fit student is eligible to enroll for a basic period of training, covering four terms. An advanced course of training, covering another four terms of work, is limited to the most promising students who successfully complete the basic training. Enrolments in the basic course are accepted at the beginning of any regular term. The Government bears all the expense of uniforms and pays the students who qualify for the advanced course approximately $200. Training is provided in infantry, ordnance departments, signal corps, corps of engineers, medical corps and quartermaster corps, with students receiving instruction appropriate to the unit in which they specialize.

Members of the advanced course of Army R.O.T.C. are exempt from selective service. Students taking the basic training may join the Army Enlisted Reserve Corps and thus be permitted to continue the joint project of completing their education and seeking a commission in the Army.

Successful completion of both the basic and advanced training plus a tour of duty at one of the Army's service schools qualifies the student for a commission as a second lieutenant in the Officer Reserve Corps.

CIVIL SERVICE EXAMINATIONS FOR JUNIOR METALLURGISTS

THE U. S. Civil Service Commission has issued the following statement:

Increasing numbers of scientifically and technically trained men and women will be required for the war effort this year and next. Junior metallurgists are urgently needed to conduct investigative, developmental or production work in various branches of metallurgy; to assist in the design, construction, installation and operation of metallurgical equipment; or to perform metallurgical work in the recovery or fabrication of metals.

The U. S. Civil Service Commission is recruiting junior metallurgists under a new announcement (No. 254) for which the qualifications are: (1) completion of a four-year college course in metallurgy or metallurgical engineering or (2) completion of a 4-year course in chemistry, geology, physics or engineering, supplemented by (a) one year of paid experience in metallurgy (college teaching in metallurgy is acceptable) or (b) 15 semester hours in metallurgy or metallurgical engineering or (c) completion of two War Training Courses in metallurgy.

There is provision for the acceptance of applications from college senior or graduate students who expect to complete the required courses within six months after filing applications.

In addition to the positions which pay $2,000 a year, there are a large number of vacancies in sub-professional positions at $1,800 and $1,620 a year. Applications will be accepted until the needs of the service have been met. There is no maximum age limit. No written test is required. Persons rated eligible as junior metallurgists under examination announcement No. 210 need not apply under the new announcement. Consult announcement No. 238 for information on higher grade positions.

Announcements and application forms may be obtained at any first- or second-class post office or from the Civil Service Commission, Washington, D. C.

COMMITTEE ON THE LOCATION OF NEW AND RARE INSTRUMENTS

REQUESTS have been received by the Committee on the Location of New and Rare Instruments for instruments from research workers who urgently need them.

If any reader of SCIENCE has such an instrument available to lend, lease or sell he is requested to write the undersigned.

INSTRUMENTS SOUGHT

Microammeters and electrical meters generally.
Ultra-violet microscope.
Zeiss Optimeter (for measuring fine wires to 0.00001″).
Two-circle Reflecting Goniometer (Goldschmidt).
Electro-Encephalograph (3 channel).
Warburg Apparatus.

The following instruments are offered for use by others and inquiries for them are invited:

INSTRUMENTS OFFERED

Zeiss-Pulfrich Refractometer.
Hunter Reflectometer (Infra red reflectance).
Coleman Spectrophotometer (complete).
Capacigraph (*Jour. of Laboratory and Clinical Medicine*, 22, 1279, 1937; 25, 175, 1939).
Mechanical Ink Writing Recorder (*Am. Jour. Obstetrics and Gynecology*, 40, 330, 1940).
Grating Spectrograph: Focal length 2 meters
Dispersion 8 Å/mm, 1st order.
Grating Spectrograph: Focal length 8 meters
Dispersion ¼ Å/mm. 4th order.

The Committee on Location of New and Rare Instruments of the Division of Chemistry and Chemical Technology, National Research Council, will be glad to put inquirers in appropriate contact with those who can supply their needs. In so doing it assumes no responsibility, and owners of instruments must make their own arrangements with prospective users. Correspondence should be addressed to D. H. Killeffer, 60 East 42nd Street, New York, N. Y.

PROGRESS ON THE CONSTRUCTION OF A HUNDRED MILLION VOLT ELECTRON ACCELERATOR

IN response to a request of the editor of SCIENCE, Dr. W. D. Coolidge has sent the following statement in regard to the hundred-million-volt electron accelerator developed in the research laboratory of the General Electric Company at Schenectady, N. Y.:

Because of the demonstrated value of high voltage x-rays in the present war activity, the members of The National Inventors Council, at their meeting in Schenectady on August 18 and 19, were shown the status of the work of the General Electric Research Laboratory on the construction of a large induction electron accelerator based on the pioneer work of Dr. Kerst, of the University of Illinois.

This machine will be quite similar to the twenty million volt accelerator which was built in this laboratory with Dr. Kerst's help and has been loaned by the General Electric Company to Dr. Kerst and the University of Illinois. The new accelerator is designed for a hundred million volts and has, because of its size, presented many new engineering problems.

At the present time the special building to house it is completed and so are the magnet coils and the 24,000 KVA capacitor for their supply circuit. Much of the work on the 125-ton laminated steel core is finished and all the materials except the glass parts for the six-foot toroidal vacuum tube have been received. It is hoped that the device may be brought into operation this year or early next.

As it should make available x-rays and high velocity electrons corresponding to voltages up to a hundred million, it promises to be a very useful research tool.

So far as its immediate interest in connection with the war effort is concerned, the device will make it possible to determine the potentialities in the industrial radiographic field of x-rays produced by such electron energies as it can generate. Whether the electron current in the tube and hence the x-ray intensity producible by such a device can be large enough to make it a practical radiographic tool remains to be seen.

PRESENTATION TO THE ROYAL SOCIETY

AT a meeting of the Royal Society on July 16, a gold snuff-box, once the property of Charles Blacker Vignoles, F.R.S. (1793–1875), was presented to the society by his grandsons, Mr. E. B. Vignoles and Lieutenant-Colonel W. A. Vignoles.

Mr. E. B. Vignoles, in making the presentation, referred to the fact that in 1841 C. B. Vignoles presented to the Royal Society a fine portrait of Sir Isaac Newton, which had come to him as the result of a connection between his mother's family and that of Sir Isaac.

Continuing, Mr. Vignoles said that his grandfather, who was of Huguenot descent, came of a long line of soldiers and that he was an orphan and a prisoner in French hands at the age of thirteen months. He was educated by his maternal grandfather, Dr. Charles Hutton, F.R.S., the mathematician, the author of "Hutton's Logarithms," in the preparation of which Vignoles assisted. As a young man he served for a time in the Army, taking part in the disastrous attack on Bergen-op-Zoom in 1814.

Following the peace after Waterloo, he went to America, where he was engaged on survey work in South Carolina and Florida, then very little known. Returning to England in 1823 he was soon engaged in railway engineering, almost his first work being the first survey for the proposed Liverpool and Manchester Railway.

In the course of a long career he carried out important work at home and abroad as a railway and civil engineer, including the great suspension bridge over the Dnieper at Kieff and a railway through the Cantabrian Pyrenees from Bilbao to Tudela, which with its sharp curves and bold moving of a river, struck a

new note in railway engineering. The "Vignoles Rail," the flat-bottomed rail of his design still used all over the world, keeps his name familiar to railway engineers.

The snuff-box, now presented to the society, was given to Vignoles by the King of Wurtemburg, in 1844, as a mark of his esteem, after Vignoles had advised the King on the plans prepared by the King's ministers and engineers for the railways of the state. The snuff-box is of solid gold with a portrait of the King set in diamonds on the lid.

Vignoles was elected a member of the Royal Society in 1855 and was president of the Institution of Civil Engineers in 1870–71.

SCIENTIFIC NOTES AND NEWS

THE Medal of the Society of Chemical Industry of Canada has been awarded to R. A. Witherspoon for achievements in the electrochemical field with Shawinigan Chemicals Limited.

DR. MASON CAMPBELL, formerly professor of dairy production at the University of Vermont, later production manager and director of the Walker-Gordon Laboratories of New England, has been named dean of the Rhode Island College of Agriculture and director of the Rhode Island Agricultural Experiment Station.

AT the recent meeting of the corporation of the Woods Hole Marine Biological Laboratory, Donald M. Brodie was selected to replace Mr. Riggs as treasurer. Dr. O. C. Glaser succeeds Dr. Philip B. Armstrong as clerk of the corporation. Two trustees, Dr. S. O. Mast and Dr. Albert P. Mathews, having passed the age of seventy years, were elected to the emeritus class. They were succeeded by Dr. Eric G. Ball, of the Harvard Medical School, and Dr. Eugene F. DuBois, of the Cornell University Medical College. Dr. O. C. Glaser and Dr. C. W. Metz have been appointed members of the executive committee of the board of trustees. They succeed Dr. P. B. Armstrong and Dr. W. C. Allee.

DR. DONALD MACGILLAVRY, JR., of the University of Amsterdam and Columbia University, who has also been research fellow at the University of Cambridge, England, has been appointed instructor in organic and analytical chemistry in the University of Pittsburgh; Dr. Glen William Kilmer, post-doctorate fellow in biochemistry at the Cornell University Medical College, has been appointed instructor in organic chemistry.

DR. WILLIAM B. WALLACE, fellow in general surgery at the Mayo Clinic, has been appointed clinical instructor in surgery at the Stanford University School of Medicine in San Francisco.

AT Yale University, Austin H. Riesen, in psychobiology; Jacob B. Fishman, in pharmacology, and Harold Lamport, in physiology, have been promoted to assistant professorships. Albert K. Kurtz, statistician, editor of *Psychometrika;* Ralph P. Wolfe and Paul S. Burnham have been appointed to assistant professorships in the department of psychology.

DR. H. BRUCE COLLIER has been appointed assistant professor of biochemistry at Dalhousie University, Halifax. He was formerly biochemist at the Institute of Parasitology of McGill University. He takes the place of Dr. R. D. H. Heard, who has become assistant professor of biochemistry at McGill University. Dr. Karl M. Wilbur, instructor in the department of zoology at the Ohio State University, is taking the place of Dr. Hugh Davson, who is on leave of absence in England for the duration of the war, as assistant professor in the department of physiology.

AT the University of London, Dr. F. G. Young has been appointed to the university chair of biochemistry tenable at St. Thomas's Hospital Medical School; B. W. Windeyer has been appointed to the university chair of radiology tenable at Middlesex Hospital Medical School, and Dr. Alexander Lawson has been appointed to the university readership in organic chemistry tenable at the London School of Medicine for Women.

ACCORDING to *Chemical and Engineering News,* Alamjit D. Singh, a member of the department of experimental engineering of the University of Illinois, has been appointed associate chemical engineer at the Armour Research Foundation, Chicago. He is also technical adviser on chemical obscuration in civil areas for the organization on techniques of the Chicago Office of Civilian Defense.

DR. CHARLES H. BEHRE, JR., professor of economic geology at Columbia University, has joined the staff of the U. S. Geological Survey for the duration of the war.

DR. R. W. HUSBAND, of the department of psychology of the Pennsylvania State College, has joined the Research Division of the Industrial Relations Department of the Carnegie-Illinois Steel Corporation.

DR. CLARENCE W. SONDERN, Kansas City, and Dr. Willard M. Hoehn, formerly of Rochester, Minn., have been appointed directors of the newly established research chemicals division of the Laboratories of George A. Breon and Company, Kansas City, Mo. Synthetic organic chemicals, including bile acids, hormones and vitamins, will be prepared at the laboratory.

DR. FREDERICK W. SULLIVAN, JR., director of research of the Barrett Division of the Allied Chemical and Dye Corporation, has been appointed technical director of the Institute of Gas Technology, Chicago, which is affiliated with the Illinois Institute of Technology. He will have supervision of all research work. The Gas Institute is the only institution in the country where students may work for graduate degrees in gas technology. It was founded with four principal objectives: the training of personnel for the gas industry, the prosecution of fundamental research in gas technology, the collection and dissemination of scientific information and the conduct of applied research investigations on specific industrial problems.

DR. F. EBERSON has resigned as medical and research director of the National Drug Company, Philadelphia, to become pathologist and chief of laboratory service of the U. S. Veterans Administration Facility, Pittsburgh, Pennsylvania.

E. ROSS HENNINGER, of Haworth, N. J., who formerly edited technical publications for the American Institute of Electrical Engineers, has been nominated by President Roosevelt to be liaison officer of the Army Specialist Corps, Washington, with the rank of lieutenant-colonel.

DR. SHARAT K. ROY, curator of geology at Field Museum of Natural History, has been commissioned a captain in the U. S. Army. Rupert L. Wenzel, assistant curator of insects, has also left to accept an appointment as first lieutenant in the Sanitary Corps of the army.

THE Medical Library Association held its forty-fourth annual meeting in New Orleans, on May 7, 8 and 9. Headquarters were at the Jung Hotel and the sessions met in the auditorium of the New Hutchinson Memorial of the School of Medicine of Tulane University. Officers elected for the coming year are: Mary Louise Marshall, Tulane, *President;* Dr. John F. Fulton, Yale, *Vice-president;* Frida Pliefke, Mayo Clinic, *Secretary;* Bertha B. Hallam, Oregon, *Treasurer.* The program featured a Symposium on Tropical Medicine, Medicine in the South and the Medical Library, in the War program. Selection of the place for the 1943 meeting has not yet been made.

THE American Foundation for Tropical Medicine has announced the establishment of two paid fellowships at the Graduate School of Tropical Medicine of Tulane University of Louisiana. They have been made possible by the Winthrop Chemical Company, Inc., Winthrop Products, Inc., and the Lambert Pharmacal Company of St. Louis. These fellowships, which will be known as the Winthrop Fellowship and the Lambert Pharmacal Company of St. Louis, Mo., Fellowship, have been established to provide graduate training in tropical medicine for young physicians who are citizens of the United States. Applications should be addressed to the dean of graduate studies, Tulane University, New Orleans.

BEGINNING with Volume 28, Number 1, July, 1942, of the *American Midland Naturalist,* the following editors will review papers in vertebrate zoology: Dr. Karl P. Schmidt, Field Museum of Natural History, Chicago, papers in ichthyology and herpetology; Dr. Jean M. Linsdale, Hastings Reservation, Jamesburg Route, Monterey, Calif., papers on ornithology; Dr. Remington Kellogg, U.S. National Museum, papers in mammalogy.

FOR the second time, Cleveland Health Museum has received a grant from the Thomas H. White Trust Fund, in the amount of $1,100. This grant has been made to establish at the museum a permanent exhibit on nutrition and health. It is planned to open the exhibit in the early part of January, 1943.

THE Lewis Cass Ledyard, Jr., Fellowship of the Society of the New York Hospital was established in 1939 by a gift from Mrs. Ruth E. Ledyard, in memory of her late husband, Lewis Cass Ledyard, Jr., a governor of the New York Hospital. The income, amounting to approximately $4,000 annually, will be awarded to an investigator in the fields of medicine and surgery, or in any closely related field. This amount will be applied as follows: $3,000 as a stipend and, approximately, $1,000 for supplies or expenses of the research. In making the award, preference will be given to younger applicants who are graduates in medicine and who have demonstrated fitness to carry on original research of a high order. Applications for the year 1942–43 should be in the hands of the committee by December 15. It is expected that the award will be made by March 15, 1943. They should be addressed to: The Committee of the Lewis Cass Ledyard, Jr., Fellowship, The Society of the New York Hospital, 525 East 68th Street, New York, N. Y.

DR. CHARLES F. KETTERING, chairman of the National Inventors Council, a government agency under the Department of Commerce, on the occasion of the meeting of the council at the General Electric Company, announced that Americans, many of them non-professionals, have submitted to date 91,823 suggestions which they believe will help the Army and Navy in winning the war. In a two-day meeting of the council, the most recent and promising of these inventions were discussed and evaluated preliminary to making them available to the armed services. Ideas have been welcomed from amateurs because their suggestions in many cases prove fruitful and of practical use. Often

500 to 1,000 inventive ideas are received in a day at the Washington offices of the National Inventors Council.

THE establishment of a combined engineering and chemistry curriculum leading to the degree of master of science in chemical engineering at the University of California has been announced. The course is planned to give students a well-balanced training in both fields. Several departments, including chemistry, metallurgy, mechanical engineering, mining engineering and petroleum engineering, will cooperate in training graduate students for the new degree.

THE University of Pittsburgh will offer a course in "Military Chemistry and Chemical Agents" each trimester beginning on September 28. It will be based on "Technical Manual 3–215" of the War Department and will cover all the fundamentals and principles which are required by the manual. Two fully illustrated lectures will be given weekly by Dr. A. L. Robinson, of the department of chemistry. The purpose of the course is to train prospective registrants for military service.

THE Polytechnic Institute of Brooklyn plans a course in the fall of 1942–1943 in the reading of chemical Russian. This course will be given on Tuesday evenings throughout the year. It is designed to give a mastery of the grammatical principles and the vocabulary necessary for the translation of technical articles from Russian reference books and periodicals. Registrants need not have had previous experience with the Russian language, but must have studied some other modern foreign language. The work will involve supervised study and translation from chemical journals. Dr. Karl Steik, a consulting chemist, is in charge. Information may be obtained from Professor Raymond E. Kirk, of the department of chemistry.

IT is reported in the *Journal* of the American Medical Association that an agreement between the Southwestern Medical Foundation and Baylor University to set up a medical center in Dallas was approved at a special meeting of the executive board of the Baptist General Convention on July 7. The project has been under consideration for eight months. Under a ninety-nine year contract the medical and dental schools of the university will be moved, as soon as buildings are provided, to a 35-acre tract along Hines Boulevard and including Parkland Hospital. Under the contract one million dollars will be expended by the foundation for buildings for medical teaching, construction to start within a period of not less than two years after removal of priority restrictions. Parkland Hospital will be enlarged and become an integral part of the center, its facilities to be used in connection with the medical and dental colleges. The site for the center is within a few blocks of a large group of children's hospitals, including the Children's Hospital of Texas, the Scottish Rite Hospital for Crippled Children, Hope Cottage, Bradford Memorial Hospital for Babies and Freeman Memorial Clinic. The agreement places the two schools under the control of a joint board including three members from the foundation and two from Baylor. The university, which has been under supervision of the executive board of the Baptist General Convention, will be conducted on a non-sectarian basis. Development of the medical center will be in cooperation with the city-county hospital board administering Parkland Hospital, where the first aim of the medical foundation will be to improve clinical facilities. A dispensary will be the first unit in the new construction program. In addition to providing the buildings, the foundation will also furnish money for teaching. The medical school will continue to receive income from endowment, but Baylor University will retain the endowment fund. All student fees will go into the fund for teaching.

THE University of Rochester has received more than $300,000 from the late Mary M. Condon to set up a fund known as the John P. Munn Fund in memory of Dr. John P. Munn, former chairman of the board of trustees of the university, whose secretary she had been, for "such university purposes as, in the opinion of the board of trustees, would have been generally favored by Dr. Munn." Miss Condon, who died in 1941, left a gross estate of $134,620 and a net of $129,301, all of which goes to the university. Before her death Miss Condon had turned over more than $190,000 in cash and securities to the university, from the greater part of which the university agreed to pay her the income until her death.

THE recently issued report of the Eastman Dental Dispensary for 1941 states that the Germans have taken over the Brussels and Paris Clinics and are using them to a great extent for services for their troops. The London Clinic, while it has suffered some damage from air raids, is giving about 500 treatments per week to children. In Stockholm, all departments of the clinic are functioning in excellent fashion.

IT is reported in *Nature* that Lord Louis Mountbatten, vice-president of the Institution of Radio Engineers, has given a prize to the institution, to be known as the Mountbatten Medal; it will be "awarded to the candidate who has proved himself the best candidate amongst those of the Royal Navy or Air Force who have presented themselves for the graduateship examinations of the institution held during the year."

DISCUSSION

THE MAGNETIC ION

THE general belief that our universe consists of matter (of the chemical elements) and of electricity is founded on the observations of M. Faraday,[1] who stated that there are material bodies moving in homogeneous electric fields in the direction of the electric lines of force or against them. These bodies, whose direction of motion is reversed with the field, were called "ions" by M. Faraday. Thus an electric ion is a body or particle which carries an excess of positive or negative electric charge.

It is well known that electric ions can be produced by different means such as friction, chemical processes, light and other ionizing agents (for example, radium), etc., and that the charges on these ions can also be changed by the same means.

Magnetism played a secondary role for the last centuries, since during all that time the opinion prevailed that there are no true magnetic charges. No matter how small a body or particle was, it always was supposed to have the same amount of north as of south magnetism. This opinion was based on observations according to which a body directed itself in the direction of the homogeneous magnetic lines of force as a compass needle does in the geomagnetic field, but did not move from its place.[2] Thus a force acting on the north magnetic pole was supposed to be equal to that on the south magnetic one and therefore only such oppositely charged magnetic dipoles were believed to exist. According to J. M. Ampere, each of the dipoles or magnets could be substituted by circular electric currents. Therefore, particles or bodies with an excess of magnetic charge should not exist.

However, more sensitive experiments of F. Ehrenhaft,[3] carried out on very small test bodies with greater mobilities in strong homogeneous magnetic fields, showed that particles of various elements such as Fe, Ni, Sb, etc., move in or against the direction of the lines of force if they were irradiated by light (magneto-photophoresis). From a swarm of such particles, which are suspended in gas, some move towards the north magnetrode some towards the south magnetrode, while others remain at rest. The moving bodies reverse the direction of motion with the field and stop instantly if the magnetic field is shut off. Their velocities increase or decrease if the intensity of the illuminating beam increases or decreases. Furthermore, the test bodies pass very closely to each other in opposite directions.

In the spirit of M. Faraday and J. C. Maxwell one must therefore conclude[4] that there is an excess of magnetic charge on these test bodies which show a distinct motion under the influence of homogeneous magnetic fields. These particles, therefore must be considered as magnetic ions. Furthermore, there are, as F. Ehrenhaft has shown,[5] magnetic currents since the flow of these magnetic ions itself represents a magnetic current.

Just as there are electric ions created by light, light can also produce magnetic ions, *i.e.*, bodies, which move in homogeneous magnetic fields.

In the following recent experiments will be described which demonstrate that the magnetic ions, which are produced by light, are only a special case of a much more general phenomenon. The experiments were executed in an Ehrenhaft condenser[6] whose plates (8 mm in diameter and about 2 mm apart), were the basis of iron cylinders which created a vertical magnetic field whose direction could be reversed at will. A reversible electric field could likewise be applied in the same direction if needed. Both fields were strictly independent from each other. All observations were carried out in the dark field of a microscope (n.a. 0, 36).

If one places a minute amount of very fine powder, such as Fe, Ni, Mn, Cr, Sb, in the exact center of the lower magnetrode, one can see, as soon as the magnetic field is applied, that some of the particles move toward the upper plate, while others remain at rest. It is also possible to place some particles on the upper plate only. Of these some move toward the lower magnetrode as soon as the magnetic field is applied, while the others remain at rest. It is even possible to combine both experiments at the same time. One then observes that some of the particles move toward the north and some toward the south magnetrode, carrying charges opposite to those of the plates, to which they move. The particles arrange themselves on the magnetrodes in the direction of the lines of force and in needle-like masses parallel to each other and perpendicular to the plates. These needles are similar to those which were observed in non-homogeneous fields since De la Hire.[7] Since this

[1] M. Faraday, *Exp. Res. in Electr.*, Vol. I, VIII, 665, 1839.

[2] R. Norman, "A New Attractive," etc., Chapter VI, anno 1576; W. Gilbert, "De Magnete," etc., Book IV, Chapter VI, anno 1628.

[3] F. Ehrenhaft, *C. R.* (*Paris*), 190: 263, 1930; *Phys. Zeitschrift*, 31: 478, 1930; *Phil. Mag.*, XI: 140, 1931.

[4] J. C. Maxwell, "Treat. El. et Magn.," Ed., Oxford, 1873, art. 377–379.

[5] F. Ehrenhaft, *Jour. Franklin Inst.*, 230: 381, 1940; *Nature* (London), 147: 25, 1941; SCIENCE, 94: 232, 1941; *Jour. Franklin Inst.*, 233: 235, 1942.

[6] F. Ehrenhaft, *Sitz. Berichte der Wiener Ak. D. Wiss.*, 119 (IIa), 815, 1910; *Phys. Zeitschr.*, 11: 619, 1910; *Ann. des Physique*, Paris, 13: 151, 1940; *Philosophy of science*, 8: 3, 1941. "The Microcoulomb Experiment" (charges smaller than the electronic charge).

experiment can be performed without light as well, there is evidence of motion of matter under the influence of homogeneous magnetic fields in both directions in darkness too. It is remarkable that one can easily distinguish two kinds of motion if one makes the field slightly non-homogeneous, by putting the plates at a very slight angle. While all ferromagnetic particles move in the direction of the denser lines of force (M. Faraday[8]), thus laterally and non-reversibly with the field, some of them, the charged ones, at the same time also show a superposed motion towards the plates, reversing this motion with the reversal of the field. Instead of placing the particles on the basis of the magnetrodes one can suspend them in gas in the space between the plates and observe in very diffused light a movement towards both plates, which in many cases was reversed with the reversal of the field.

Moreover, even in liquids one can observe such movements, which can only be explained if one assumes the existence of magnetic charges. Colloidal particles, for example, of Ni[9] or powdered particles suspended in various liquids, such as water, castor oil and glycerine, move, when exposed to the influence of homogeneous magnetic fields, toward the gold-plated magnetrodes and are finally deposited on them.

This is evidence that there is a phenomenon analogous to the well-known phenomenon of electrophoresis (cataphoresis)[10] and which should be termed "magneto-phoresis." The micro-photographs show that the deposits are coagulated in similar manner as the deposits of electrophoresis. It is also possible to observe the movement of individual particles under the influence of homogeneous magnetic fields as well as homogeneous electric fields independent of each other. These observations showed that the particles behaved similarly in both fields. However, the difference could be particularly well noticed on Cu particles which moved only in electric fields, but not in magnetic ones and on some iron particles which moved in magnetic fields but not in electric ones.

In order to explain all the phenomena which one can observe on magnetic ions one has to make similar assumptions as in the interpretation of phenomena on electric ions (f.i. change of charge, space charges and double layers). Thus, the changes of direction and of velocity occurring frequently and spontaneously during the observations must be explained as changes of magnetic charge. Up to the present, artificial change of magnetic charge could be achieved by means of irradiation by light and by the application of friction. However, irradiation with radium which changed the electric charge easily did not alter the magnetic charge at all.

The discovery of magnetic ions led to the conclusion that Ampere's[11] hypothesis, stating that every magnet can be substituted in its effects by circular electric currents, can not be considered as valid in general any more, since one can not apply it to bodies, where an excess of magnetic charge has been proved by means of such simple experiments as were described above. It also led to the conclusion of the existence of the magnetic current mentioned before.

The unit of the magnetic current is defined as the flow of the unit of true magnetism through the unit of cross-section during the unit of time. It is understood that the unit of true magnetism is the magnetic charge which exerts a force of one dyne on an equal one placed at the distance of 1 cm in the vacuum.

Other experiments and important conclusions will be reported later.[12]

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[7] De la Hire, Memoir de l'Acad. Roy. des sciences des Paris, anno 1717.

[8] M. Faraday, *Exp. Res. in Electr.*, etc., Vol. III, XXI, 8455, 1855.

[9] F. Ehrenhaft, *Akad. Anzeiger d. K. Ak. d. Wiss. Wien*, July 10, 1902, No. XVIII.

[10] F. F. Reuss, Mem. Soc. Imp. des Naturalistes de Moscou, 2, 327, 1809.

[11] J. M. Ampere, "Exposé de Nouv. dec. sur. l'electr. et le magnet." Paris, 1822.

[12] The experiments described above were carried out at Carl Zeiss, Inc., New York, N. Y., where they can be demonstrated by the authors.

NEW STEREOISOMERS OF METHYLBIXIN

THE pigment from the seeds of the Annato tree (*Bixa orellana* L.), bixin, $HOOC \cdot C_{22}H_{26} \cdot COOCH_3$, and its methylester, methylbixin, $CH_3OOC \cdot C_{22}H_{26} \cdot COOCH_3$, differ from most natural polyenes in their stereochemical configuration. It was found by earlier investigators[1] that Bixa pigments are labile forms which can be converted into the corresponding stable isomers by iodine, irradiation, etc. Therefore, the natural product and its ester must contain at least one *cis* double bond. Despite the elapse of a decade no further progress has been reported in this field. So far as we know, not even the reversibility of the conversion mentioned has been claimed.

In experiments carried out recently in these laboratories it was shown that numerous stereoisomers of natural[2] and synthetic[3] polyenes can be obtained in a

[1] P. Karrer, A. Helfenstein, R. Widmer and Th. B. van Itallie, *Helv. chim. Acta*, 12: 741, 1929; R. Kuhn and A. Winterstein, *Ber.*, 66: 209, 1933 and 67: 344, 1934; P. Karrer and U. Solmssen, *Helv. chim. Acta*, 20: 1396, 1937.

[2] L. Zechmeister, A. L. LeRosen, F. W. Went and L. Pauling, *Proc. Nat. Acad. Sci.*, 27: 468, 1941; A. L. LeRosen and L. Zechmeister, *Jour. Am. Chem. Soc.*, 64: 1075, 1942; L. Zechmeister and W. A. Schroeder, *Jour. Am. Chem. Soc.*, 64: 1173, 1942.

[3] L. Zechmeister and A. L. LeRosen, SCIENCE, 95: 587, 1942.

reversible way. The methods used, especially iodine catalysis and melting of crystals, are now being applied to methylbixin. We have found that the *cis-trans* conversion mentioned above is reversible, and furthermore that not a single compound but a complicated equilibrium mixture of stereoisomers is formed. The latter can be separated on a Tswett column, using calcium carbonate (Merck's Heavy Powder) and benzene-petroleum ether mixtures.

So far 8 stereoisomeric methylbixins have been observed on the column, above and below the all-*trans* zone; of these several have been crystallized. They differ spectroscopically by 0–16 mμ from the all-*trans* compound which possesses the longest wave-length maxima (490, 457 mμ in petroleum ether). On addition of iodine the spectra of all these stereoisomers shift to about 488.5, 455 mμ.

A new type of rapid isomerization was observed with fresh methylbixin solutions at 20°. No all-*trans* isomer was present in this equilibrium, and it appeared only upon iodine addition.

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SEAWEEDS AT BEAUFORT, NORTH CAROLINA, AS A SOURCE OF AGAR

RECENT articles on methods for reclaiming used agar, on preparation of agar substitutes, and on means of conserving agar give evidence of the increasing concern over future sources of supply, especially for bacteriological requirements.

Agar has been produced commercially on the California coast for a number of years, and this production has been increased considerably during the past few months. However, agar for bacteriological purposes apparently is not being produced along the Atlantic coast. The long-established "Irish moss" industry of Massachusetts seems to be the nearest approach to the production of bacteriological agar in the eastern United States.

On June 1, 1942, an investigation of possibilities of producing agar from seaweeds of the North Carolina coast was begun at the Duke University Marine Laboratory at Beaufort, N. C. Although this work is still in its early stages, it has seemed advisable to announce certain findings because of the pressing need for new sources of agar.

The plans of this work include a systematic test of all the more common, larger species of red algae of the Atlantic coast from Beaufort southward to the Florida Keys but especially in the vicinity of Beaufort.

The most common red alga in certain parts of the Beaufort region during summer is *Gracilaria confervoides* (L.) Greville. Hoyt[1] states that it is present from April to November and that this species has been used "for the making of jellies in a way similar to the use of the 'Irish moss,' *Chondrus crispus*, of our northern coast." Preliminary tests indicate that from 25 to 35 per cent. of the air-dry weight of this alga is agar. Its wet weight is about 17 times that of the dry weight. Agar has been produced from this species at the Duke University Laboratory since about June 15 and has satisfactorily met bacteriological requirements.

The method of preparation used is similar to that given by Field.[2] Freshly collected material is washed with sea water and spread out to dry and bleach. From three days to a week are required for this process. Daily sprinkling with sea water is necessary to make bleaching complete. Whether or not the material is damaged by washing or wetting with fresh water has not yet been determined. When bleached and dry the seaweed is boiled in about 50 times as much fresh water by weight as seaweed. This is kept up to or above 50 per cent. of its original volume by occasionally adding more water during the boiling process. The liquid is then strained through several thicknesses of linen cloth and poured into shallow pans to cool and solidify. From this point on it is treated in a manner similar to that described by Thaller[3] for reclamation of used agar and a reasonably pure product is obtained. A 1.5 per cent. solution forms a sufficiently hard gel in a Petri dish to permit streaking with an inoculating needle.

If a purified agar is not required, 20 grams of dried Gracilaria may be placed in a cloth bag in a flask containing 500 or 600 cc of water (with nutrients if desired). This is autoclaved and the agar solution poured directly into Petri dishes for use.

Gracilaria confervoides is present in certain areas near Beaufort in large quantities and it can be collected with ease. In more favorable localities one person can gather 100 pounds wet weight of this material in an hour. There are many square acres of bottom that produce this alga in such abundance during summer months. Preliminary studies on the possibilities of cultivation of Gracilaria have shown a remarkable growth rate. Small stems about three inches long tied to pieces of tile and placed in a favorable habitat increased about ten-fold in two weeks during July.

Probably the second most common red alga of the Beaufort region during summer is *Hypnea musciformis* (Wulfen) Lamouroux. It is present the year

[1] W. D. Hoyt, *Bull. Bureau Fisheries (U. S.)*, 36: 367-556, 1917.

[2] I. A. Field, Econ. Circ. No. 51, Bureau of Fisheries (U. S.), 1921.

[3] H. I. Thaller, SCIENCE, 96: 23–24, 1942.

around but less abundant during winter. Agar can be made from this species also; that produced so far has been of inferior but usable quality. Difficulty has been encountered in bleaching Hypnea, although perfectly bleached pieces are sometimes found along the beach.

Tests on species of algae that are not sufficiently abundant at any time of year to afford a significant supply of agar are being carried out in the hope that, should some exceptionally favorable species be found, methods for cultivation can be worked out. *Lomentaria uncinata* Meneghini, for example, yields a very high percentage of agar, but because it is such a small plant and not very abundant, it is commercially out of the question. Many species at Beaufort are restricted in abundance only because of the limited extent of suitable surfaces to which they can attach.

Early in June determinations were made on the alginic acid content of two species of pelagic Sargassum, *S. natans* (L.) Meyen and *S. fluitans* Børgesen. Apparently the alginic acid content of these is very small. Similar determinations are planned for all the more common, large species of brown algae.

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THE CAUSE OF DOMESTICATION

THE suggestion that the dog may have been domesticated in part for its value as a scavenger[1] may have some pertinence, but we should not forget that primitive people do not object to smells as much as we do, and that they seem to care very little about sanitation. Moreover, most of them lived so they could move easily and probably they did move rather frequently, thus wittingly or unwittingly solving the refuse problem.

While utility has been a great factor in all domesticating, it is not all-powerful, for, if it were, the list of domesticated organisms would be much larger than it is. In other words, we could profitably use the qualifications of many that have not been reduced to domestication.

It is nearly, if not entirely, true that prehistoric man did all the domesticating. Hence, if we are not prepared to admit that he had faculties along this line superior to those of historic man, we must conclude that the organisms domesticated, themselves contributed to the result. As the admission can scarcely be made, the conclusion is unavoidable. The dog is a clear example; it prefers to associate with man. Tamability exists in gradations; some creatures readily tame, others are refractory. The domesticated forms derive from the more susceptible kinds and, considering primitive man's success in contrast to advanced man's failure in domestications, it seems certain that the organisms involved must have had favorable tendencies to that state and must have helped to domesticate themselves.

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U. S. FISH AND WILDLIFE SERVICE,
WASHINGTON, D. C.

[1] SCIENCE, 96: 111–112, July 31, 1942.

OFFPRINTS FOR THE SCIENTIFIC MEN OF SOVIET RUSSIA

I HAVE recently received a letter, dated May 25, 1942, from Professor Alexander R. Luria, the prominent Russian psychologist. Professor Luria, whose book in English, "The Nature of Human Conflict," is well known to American readers and who was scheduled to visit this country to deliver the Salmon Memorial Lectures at the New York Academy of Medicine, is now in the Province of Cheliabinsk in the Ural Mountains. He is directing a clinic for the rehabilitation of the brain-injured in the war. He writes that he and his colleagues are very much in need of offprints from recent original American publications in the field of brain pathology and abnormal psychology, particularly those dealing with re-education and neurosurgery. He would like to receive such material as immediately as possible.

The American-Russian Committee for Medical Aid to the USSR, of which Prince Vladimir V. Koudasheff is the chairman and Dr. Michael Michailovsky is the treasurer, has kindly offered to transmit to Professor Luria literature sent to them and designated for him. Their address is 55 West 42d Street, New York, N. Y. It is also possible to mail directly to Professor A. R. Luria, Neurosurgical Rehabilitative Clinic of VIEM, Kisegatch Sanatorium, Cheliabinsk Oblast, USSR.

It is hoped that American scientists who have pertinent material will heed this call. It may furthermore be presumed that the needs of Professor Luria and his clinic are typical, and that in general American scientists who have formerly corresponded with Russian colleagues should continue sending important offprints that in some way bear upon war needs. Indeed, only three months ago the writer received a request from the Tbilisi Institute of Physiology for an offprint that is neither very important nor remotely related to war research. However, the situation has doubtlessly changed since, and correspondents may do well to discriminate for the time being in what they send.

The U. S. Post Office accepts first-class matter and printed material not exceeding four pounds and six ounces for mailing to the USSR, and wherever locations of institutes and universities have been changed, as many have, the Soviet authorities no doubt have the information for proper forwarding.

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QUOTATIONS

THEY ALSO SUFFER

WHILE war ravages humanity, lower forms of life get scant consideration. Even in times of peace it is difficult to protect the flowers, forests, birds and beasts, and when war comes the bars are wholly down. In the jungles of Malaysia and Papuasia, the wealth of life is so overpowering it is doubtful if thousands of "infiltrating" soldiers can do much permanent harm, but even there some animal and plant life is jeopardized. This is especially true on small islands which often form the exclusive habitat of peculiar animals. A soldier off duty is seldom averse to shooting anything subhuman and he is especially willing when it may provide a variation for the daily mess. He can not be fighting all the time, and his opportunities for wantonness must be frequent. As Kipling pointed out, we can not expect even our own men to be "plaster saints," and when it comes to our enemies, especially the Japanese, there is little hope.

The war has spread to so many out-of-the-way places that natural conditions are bound to be greatly disturbed, and it is not unlikely that exterminations or near exterminations will be among the many deplorable by-products. On the treeless Aleutian Islands of Attu and Kiska, recently occupied by the Japanese, are distinct species of ptarmigan, handsome grouse-like birds, nominally protected by our laws, but doubtless due to go into the soldier's pot by hundreds. In this region also is the sea otter, one of the most interesting of living mammals and one of great potential economic value. From the verge of extinction it has just been restored to numbers thought to guarantee its continuation, but under war conditions its fate may again become uncertain. Another important animal of this region is the fur seal which passes regularly through the Aleutians on its migrations. It is interesting to note that our long-standing treaty with Japan, by which she agreed not to kill seals on the high seas, was abrogated before war began. This treaty was profitable to Japan, and her refusal to continue it seems explainable only on the assumption that she expected to occupy our territory.

Examples of threats in other regions could be multiplied. North Africa, especially, might furnish a number, but there are some much nearer home. The danger to our western forests from fires set by incendiary bombs is a very real one which was quickly recognized, and protective measures are doubtless being taken, but the task is well-nigh insuperable. We can only hope for success.

As so often said, our first business is to win the war, but the naturalists and conservationists can scarcely be blamed if their thoughts and sympathies turn occasionally to the killings that are not mentioned in the official communiqués.

Field Museum News

SCIENTIFIC BOOKS

ASTRONOMY

Essentials of Astronomy. By JOHN CHARLES DUNCAN. Illustrated. 181 pp., 14 appendices, star maps. New York: Harper and Bros. $1.85.

CELESTIAL coordinates, spectrum analysis, proper motion—these are the straws which often strain teacher and student alike in the usual college first-year course in astronomy. Also, to greater degree, they and other concepts overthrow good intentions of would-be amateur astronomers and intelligent laymen taking extension and adult education courses.

A formidable text does not help particularly when 90 per cent. of such students are probably making their first and last serious contact with astronomy.

Write a volume in simple, fluid terms (such as should be expected from one of America's best-known teachers of astronomy). Do not, however, be condescending—retain the language of the subject, and include briefly its latest advances. Give them a common-sense introduction to the sky as they see it: "The Appearance of the Sky." Follow later with compact fundamentals:

"The kinship of all the stars, including the sun, is revealed by their spectra which, being of dark lines on a continuous background, show that each star has an intensely hot interior which shines through an enveloping atmosphere of less highly heated gas."

Give them a comparatively thin volume, well illustrated and diagrammed. Give them a Kodachrome (four-color) frontispiece of well-known Orion—the pioneering achievement of "Essentials of Astronomy." Give them attractive star maps. Price the book reasonably.

Wellesley's professor of astronomy has done just these things, and as a result, astronomy classes which follow his lead should have many more "satisfied survivors" than before.

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THE FLORA OF FUKIEN PROVINCE, CHINA

Flora of Fukien and Floristic Notes on Southeastern China. 1 (1). By F. P. METCALF. xviii + 82 pp. 2 maps. 1942.

THIS first part of a projected flora of Fukien

Province, China, is much more than a flora of that particular province. While the Fukien species of the families treated are considered in detail, with keys to genera and species, descriptions, synonymy and citation of specimens, a great many species from neighboring provinces are included, particularly those of Chekiang, Kiangsi, Kwangtung, Hunan and Kwangsi. In addition to the introductory and historical matter appertaining to the Province of Fukien, many species occurring in neighboring provinces are described. The first part, now available, considers the families and genera of the Gymnospermae and the dicotyledonous families from the Casuarinaceae to the Fagaceae, inclusive. The work is published by Lingnan University, 150 Fifth Avenue, New York.

E. D. MERRILL

REPORTS

THE NATIONAL HEALTH IN GREAT BRITAIN AFTER NEARLY THREE YEARS OF WAR[1]

GOOD reports on the national health during the war have previously been given. The survey can now be extended to the third winter of the war and most of the third year, with similar results. In the House of Commons the minister of health, Mr. Ernest Brown, stated that after one thousand days of war the health of the nation was in many respects better than in days of peace. The birth rate of 1941 was 14.2 per thousand as compared with 15.1 in 1938 and 20.9 in 1916. (This only exemplifies the falling birth rate, which was causing concern before the war). But for the first quarter of 1942 the rate was 15.5, the highest in any March quarter since 1931. The rise can be accounted for by the increase of marriages promoted by the allowances paid for wives and children of the young men joining the fighting services. The infant mortality rate for 1941 was 59, as compared with 53 in 1938 and 91 in 1916. The rate for the first quarter of 1942 was 61, the lowest rate for any first quarter on record. The maternal mortality rate in 1941 was 2.77 per thousand births as compared with 2.97 in 1936 and 4.12 in 1916. Thus while over a long period the birth rate had been falling, over the same period the survival rate had increased. The "crude general death rate" was 12.9 in 1941 as compared with 11.6 (the lowest on record) in 1938 and 14.4 in 1936. The risk of epidemic disease calls for special care in wartime, but during the past two and one half years of war the infectious disease rate has been normal and, on the whole, below the average.

Apart from tuberculosis, the only infectious disease which has shown a rise during the war is cerebrospinal fever. This was expected, since cerebrospinal fever has always been a wartime disease. In 1916 there were about 2,000 cases and in 1938 and 1939, 1,500 and 1,300, respectively. But in 1940 there were nearly 13,000 and in 1941 over 11,000 and, for the first half of 1942, 4,000. The fatality of the disease has been reduced from a percentage of 69 in 1935 to 34 and more recently to 20.

[1] London correspondent of the *Journal* of the American Medical Association.

The problem of tuberculosis is causing some concern. There were 28,669 deaths due to it in 1941, compared with 28,144 in 1940, 26,176 in 1938 and 53,858 in 1916. The steady fall in tuberculosis which has been a feature of the twenty-five years of peace has been interrupted in the last two years. Wartime conditions, such as the blackout, overcrowding and the cessation of house building, predispose to tuberculosis. In the past we tended to concentrate on treatment rather than on early diagnosis. The recent developments in miniature radiography are providing a new weapon to detect cases for more detailed examination. From earlier diagnosis better results in treatment are expected. Also rehabilitation and securing gradual return to suitable employment is to be tackled on more comprehensive lines.

The incidence of diphtheria, the chief killing disease of children between 4 and 10, has not fluctuated very widely in the last twenty-five years, but the number of deaths has fallen from 5,300 in 1916 to 2,600 in 1941. During the past year the Ministry of Health has been engaged in a campaign for immunization of children against diphtheria, and this has given striking results in reducing both incidence and fatality of the disease. Scarlet fever has become a scourge of the past, and there were only 133 deaths from it in 1941. In that year there were only 148 deaths from typhoid and fewer than 5,000 as compared with 6,000 cases and 1,100 deaths in 1916. During the heavy bombing of our cities not a single death from typhoid was due to pollution by water-borne infection, in spite of the continuous bombing of our crowded areas. American visitors marveled at this. The number of deaths from pneumonia was much greater in 1941 than from all the other infectious diseases combined other than tuberculosis. There were 50,000 cases and 26,000 deaths, compared with 29,000 deaths in 1940 and 23,000 in 1939.

An increase in venereal diseases was not unexpected in view of war conditions but was not so great as in the last war. At the outset steps were taken to expand the existing services. We have always relied on propaganda and education for controlling these diseases. But the work of limiting the spread of infec-

tion was hampered by lack of powers to deal with persons unwilling to submit to treatment and known to infect others. This difficult problem is engaging attention.

At the end of April, 1939, the number of state-registered nurses was 94,200. In April, 1942, the number had risen to 103,700. But there is still a shortage, and 12,000 more are required. The tuberculosis service in particular has exceptional difficulties in securing adequate numbers. Fear of contracting the disease in sanatoriums appears to be a factor, though the authorities hold that there is no greater risk than in other hospitals.

The demand for doctors in the fighting forces has entailed a shortage for civilian purposes. The government has asked the public to recognize the difficulty and do what it can to limit calls to what is essential.

SPECIAL ARTICLES

ABSORPTION OF SELENIUM BY CORN FROM ASTRAGALUS EXTRACTS AND SOLUTIONS CONTAINING PROTEINS

BESIDES being highly toxic to livestock, selenium indicator plants serve as converters of selenium. They absorb selenium from the soil, change it into water-soluble compounds, and through decay return it to the soil in forms readily available for absorption by all types of plants, including farm crops. Soil-plot experiments by Beath and his associates[1] have shown that selenium derived from a water extract of an indicator plant is much more readily accumulated than selenium from an inorganic compound such as sodium selenite.

We have recently made a quantitative comparison of a water extract of *Astragalus bisulcatus* and sodium selenite (Na_2SeO_3) as sources of selenium for absorption and accumulation by young corn plants growing in solution cultures. Another phase of our study dealt with the possible influence of proteins and their derivatives on the absorption of inorganic sodium selenite.

Pioneer hybrid corn no. 307 was germinated in quartz sand. When the seedlings were about 8 cm high they were transferred to a mineral culture solution of the usual composition[2] to which either *Astragalus* extract or sodium selenite had been added. The culture solutions were renewed twice a week, and after the plants had grown for three weeks they were dried, weighed and analyzed for selenium. The extract was prepared by soaking finely ground seleniferous *Astragalus bisulcatus* in culture solution for 16 hours at room temperature and then filtering with suction; about 75 per cent. of the selenium in the *Astragalus* powder was removed, and the extract contained approximately 40 ppm of selenium.

The curves in Fig. 1 show far greater absorption and accumulation of selenium from a water extract of *Astragalus* than from sodium selenite. The selenium content of the corn seedlings receiving the *Astragalus* extract was from 12 to 20 times as high as that of the seedlings receiving sodium selenite. Maximum accumulation was 3,150 ppm[3] in the *Astragalus* extract series as compared with only 235 ppm in the sodium selenite series. Although reduction in growth was

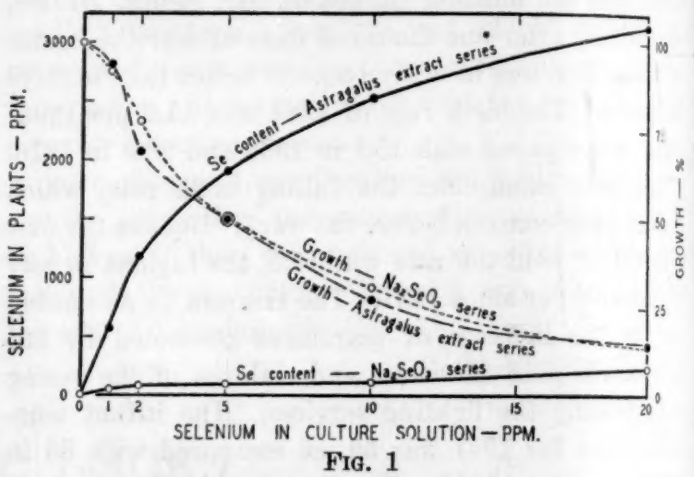

FIG. 1

about the same in both series for equivalent concentrations of selenium in the culture solution, it is evident that, per unit of selenium accumulated, the selenium in the *Astragalus* extract was much less toxic than the inorganic sodium selenite.

The selenium occurs in the extract as part of an organic compound—not as the selenite or selenate ion. Dialysis has shown that the selenium is present in molecules sufficiently small to diffuse readily through a Cellophane membrane (Du Pont or Visking), since it became equally distributed on both sides of the membrane within 48 hours at 5° C. The dialyzed selenium and the selenium in the original extract exhibited the same toxicity, and they were accumulated to the same degree by young corn plants.

In view of the much greater accumulation of selenium from an *Astragalus* extract than from sodium selenite, it seemed of interest to determine whether the addition of an organic substance to the culture solution would increase the absorption of inorganic sodium selenite. Various proteins, protein derivatives and

[1] O. A. Beath, H. F. Eppson and C. S. Gilbert, *Wyo. Agr. Exp. Sta. Bull.*, 206, 1935.

[2] S. F. Trelease and H. M. Trelease, *Am. Jour. Bot.*, 26: 530–535, 1939.

[3] This is one hundred times the maximum reported for lethal corn from naturally seleniferous soils. See: S. F. Trelease, *Scientific Monthly*, 54: 12–28, January, 1942.

amino acids (Difco) were added, each in a concentration of 50 ppm, to a culture solution containing 5 ppm of selenium as sodium selenite. Table I shows that at least four of these substances—bactotryptone, neopeptone, sodium caseinate and proteose peptone—approximately doubled the accumulation of selenium, and smaller increases were obtained with the other substances tested. It may be noted also that water extracts of alfalfa hay and of string beans had a marked effect in increasing selenium absorption.

TABLE I

INFLUENCE OF VARIOUS PROTEINS AND AMINO ACIDS IN THE CULTURE SOLUTION ON THE ACCUMULATION BY CORN SEEDLINGS OF SELENIUM SUPPLIED AS SODIUM SELENITE

Protein or amino acid in culture solution, 50 ppm.	Selenium series (5 ppm. Se as Na_2SeO_3)		Control series* (No selenium)
	Se content of plants, ppm.	Ave. dry wt. of tops, g.	Ave. dry wt. of tops, g.
Bactotryptone	471	0.90	2.23
Neopeptone	420	0.87	2.10
Sodium caseinate	413	0.92	2.26
Proteose peptone	396	0.95	3.37
Alanine	324	0.78	2.27
Tyrosine	264	1.02	2.63
Cystine	253	1.00	2.87
Tryptophane	205	1.12	2.20
Control	192	1.14	2.47
Alfalfa hay extract ..	319	0.80	1.17
Control	143	1.27	2.20
String-bean extract ..	285	0.84	0.83
Control	132	0.66	1.04

* Analysis showed that these plants contained no selenium.

Fig. 2 shows that increasing the concentration of

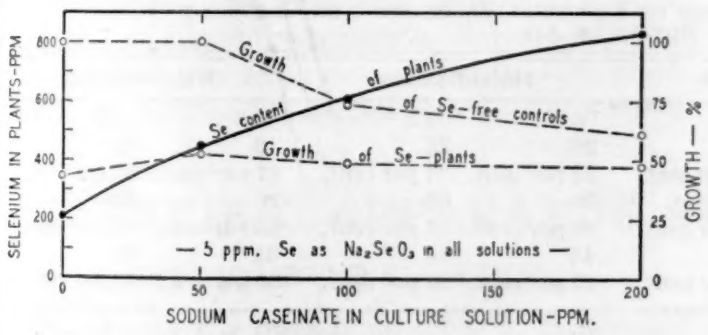

FIG. 2

sodium caseinate in a solution containing 5 ppm of selenium as sodium selenite brought about a progressive increase in the accumulation of selenium by the corn plants. With 200 ppm of sodium caseinate, the corn plants stored 830 ppm of selenium, or four times the concentration accumulated in the absence of the protein. It is of interest in this connection to note that the toxicity of selenium to rats has been found to be markedly reduced by a high proportion of protein, particularly casein, in the diet.[4]

In conclusion, it may be suggested that soils naturally high in nitrogenous organic substances may allow greater selenium accumulation by crop plants and native grasses than soils low in such substances. It would be expected that preparation of a grain field in a seleniferous area by plowing under a leguminous crop might markedly increase the absorption of selenium by the grain. Corn, other cultivated grains and native grasses, though unable to rival the true indicator plants, might nevertheless be capable of significant activity as selenium accumulators and converters in a soil rich in organic material.

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FACTORS INFLUENCING CAPILLARY PERMEABILITY IN THE VITAMIN E DEFICIENT CHICK[1]

INCREASED permeability of capillaries resulting in diffuse hemorrhage and exudation of plasma, as well as in increased migration of intravenously injected colloidal dyes into the tissues, was found by us to be an outstanding feature of vitamin E deficiency in chicks.[2, 3, 4, 5]

A further study of this condition has shown that it is possible to influence the intensity of this symptom very much by certain modifications of the diet which do not affect the vitamin E content.

Thus the appearance of exudates can be delayed and the incidence and severity of the symptom reduced by lowering of the concentration of soluble salts in the diet, whereas a high concentration of such salts—phosphates or sodium chloride—has the opposite effect. By suddenly raising the content of soluble salts considerably, exudates in the pericardium and the peritoneum and edema of muscle tissue can be produced as a regular symptom, whereas such exudates are rare on the same diet with low salt content. This observation affords some explanation as to why Bird and Culton[6] found the symptoms to be more severe on their diet (which contained 54 per cent. of dried skim milk and 1 per cent. of sodium chloride) than on our previously used diet, which has a lower salt content.

Acceleration of the onset of exudates can also be obtained by incorporating a trace of histamine in the

[1] Acknowledgement is made to the Josiah Macy Jr. Foundation for aid in conducting this work. Thanks are due to Hoffman LaRoche, Nutley, N. J., for furnishing synthetic alpha-tocopherol acetate (Ephynal acetate) and to Dr. L. R. Dragstedt, of the University of Chicago, and The Lilly Research Laboratories, Indianapolis, Ind., for lipocaic.

[2] H. Dam and J. Glavind, *Nature*, 142: 1077, 1938.

[3] *Idem*, *Nature*, 143: 810, 1939.

[4] *Idem*, *Skandinavisches Archiv f. Physiologie*, 82: 299, 1939.

[5] *Idem*, *Die Naturwissenschaften*, 28: 207, 1940.

[6] H. R. Bird and Th. G. Culton, *Proc. Soc. Exp. Biol. and Med.*, 44: 543, 1940.

[4] R. A. Gortner, Jr., *Jour. Nutrit.*, 19: 105–112, 1940.

diet or by raising the cholesterol content to about 1 per cent. That a high fat content in the diet favors the symptoms has previously been reported.[7]

These observations are interpreted by the assumption that certain regions of the capillary systems of the E-deficient chick are unable to withstand even the normal osmotic pressure of the blood and that the capillaries are easily damaged by histamine or an abnormally high supply of cholesterol as well as by other possible changes in the milieu with which the capillary wall is in contact.

The fact that fat and cholesterol favor the symptom suggested to us that it might be desirable to test the effect of some lipotropic substances.

Incorporation in the vitamin E deficient diet of 2 per cent. Lipocaic, a water-soluble preparation from pancreas (L. R. Dragstedt, *et al.*)[8] gave a high degree of protection against exudates even if the diet contained a relatively high amount of salts such as 7.2 per cent. of McCollum's salt mixture number 185. A chemical test showed that the effect of the lipocaic preparation could not be due to contamination with vitamin E. Inositol was then tested because Gavin and McHenry[9] have reported that this substance has a similar lipotropic effect as lipocaic. 1.5 per cent. of inositol in the diet was found to give a high degree of protection, whereas 1.1 per cent. of choline chloride was without any effect. Ineffective also was 5 per cent. gum arabic and 2 per cent. of acetone treated soy bean phosphatide was nearly ineffective.

This is believed to be the first instance where non-lipoid substances of animal origin have been found to counteract a symptom of vitamin E deficiency. An investigation as to whether these substances will also counteract other symptoms of lack of vitamin E, as well as a study of the protective factor in the lipocaic preparation and the way in which it acts, should be of importance in the elucidation of the mode of action of vitamin E.

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MECHANISM OF SULFONAMIDE ACTION. II. INHIBITION OF BACTERIAL RESPIRATION BY SULFANILAMIDE AND BY ITS INACTIVE ISOMERS

UNTIL very recently the only valid method for the study of sulfonamide action was based upon chemotherapeutic experiments, using animals infected with pathogenic bacteria. Recent investigations of the competitive inhibition of sulfonamides by *p*-aminobenzoic acid have shown that this antagonism can be made the basis of a suitable *in vitro* method.[1] The mechanism of the sulfonamide action is not clearly revealed by the *in vivo* experiments, and even the *in vitro* experiments based upon *p*-aminobenzoic acid antagonism involve the over-all process of bacterial growth in measuring sulfonamide activity. A recent report by Sevag *et al.*[2] attracted our attention because it was an attempt to study chemotherapeutic action of sulfonamides on a less intricate system. Our experiments using this method have convinced us that the inhibition of bacterial respiration by high concentrations of sulfonamides should not be regarded as typical sulfonamide action. We have found, for example, that the respiration of resting cells of *Escherichia coli*, *Staphylococcus aureus* or of *Streptococcus pyogenes* prepared after the manner of Sevag, is inhibited by the meta and ortho derivatives of amino benzenesulfonamide just as by sulfanilamide itself. The data in Table I show that of the two chemotherapeutically inactive isomers, the meta form behaves exactly as sulfanilamide, while the ortho form gives considerably more inhibition.

TABLE I

EFFECT OF .04 M SULFANILAMIDE AND ITS ISOMERS ON BACTERIAL RESPIRATION ON GLUCOSE IN M/60 PHOSPHATE BUFFER IN AIR

	Control		Sulfanilamide		Metanilamide		Orthanilamide	
pH	6.2	7.2	6.2	7.2	6.2	7.2	6.2	7.2
E. coli Q_{O_2}	37	38	25	24	26	25	12	11
Inhibition			32 per cent.	37 per cent.	30 per cent.	34 per cent.	67 per cent.	71 per cent.
Staph. aureus Q_{O_2}	63	51	41	38	39	35	23	30
Inhibition			35 per cent.	25 per cent.	38 per cent.	31 per cent.	63 per cent.	41 per cent.
Strep. pyogenes Q_{O_2}	55	50	44	36	44	36	35	29
Inhibition			20 per cent.	28 per cent.	20 per cent.	28 per cent.	36 per cent.	42 per cent.

E. coli is a typical fecal strain.
Staph. aureus is F.D.A. strain.
Strep. pyogenes is strain 1896 M obtained from Dr. J. S. Lockwood, University of Pennsylvania.

[7] H. Dam, J. Glavind, I. Prange and J. Ottesen, Royal Danish Academy of Science, *Biological Communications*, 16: 7, 1941.

[8] L. R. Dragstedt, C. Vermeulen, W. C. Goodpasture, P. B. Donovan and W. A. Geer, *Archives of Internal Medicine*, 64: 1017, 1939.

[9] G. Gavin and E. W. McHenry, *Jour. Biol. Chem.*, 139: 485, 1941.

[1] Orville Wyss, K. K. Grubaugh and F. C. Schmelkes, *Proc. Soc. Exp. Biol. and Med.*, 49: 618–622, 1942; H. M. Rose and C. L. Fox, SCIENCE, 95: 412–413, 1942; W. B. Wood, *Jour. Exp. Med.*, 75: 369–381, 1942.

[2] M. G. Sevag and M. Shelburne, *Jour. Bact.*, 43: 411-462, 1942.

In addition to showing that compounds totally devoid of chemotherapeutic activity (*i.e.*, true sulfonamide action) give inhibition equal to or exceeding that given by sulfanilamide, these data also show that the inhibition of the hemolytic streptococcus is not greater than that of the staphylococcus which generally is more resistant to sulfonamides.

Further, the effect upon respiration of a more active sulfonamide, sulfacetimide, was compared with that of sulfanilamide. This compound was selected because it would dissolve in .04 M concentrations. Preliminary experiments with sulfathiazole indicated that significant reductions of the rate of respiration could not be obtained with concentrations up to 100 mg per cent., the upper limit of solubility.

TABLE II

EFFECT OF .04 M SULFANILAMIDE AND SULFACETIMIDE ON RESPIRATION OF *E. coli* ON GLUCOSE IN M/60 PHOSPHATE BUFFER IN AIR

	Q_{O_2}		
	Control	.04 M Sulfanilamide	.04 M Sulfacetimide
pH 6.2	155	126	125
Inhibition ..		19 per cent.	19 per cent.
pH 7.2	143	126	121
Inhibition ..		12 per cent.	15 per cent.

Sulfacetimide shows no greater activity in this experiment than sulfanilamide. When 10 mg per cent. *p*-aminobenzoic acid was added to some of the flasks containing .04 M sulfonamide it did not reverse the inhibition of respiration by either sulfanilamide or sulfacetimide.

Finally an attempt was made to compare inhibition of respiration and of growth, using resistant organisms. The relative sulfonamide resistance of a parent strain of *E. coli* and a resistant strain developed from it is given in Table III.

TABLE III

CONCENTRATIONS OF SULFONAMIDES PERMITTING ONE-HALF MAXIMUM GROWTH RATE OF *E. coli* IN SYNTHETIC MEDIUM AT PH 7.0

	Parent Strain	Resistant Strain
Sulfanilamide ...	3.4 mg per cent.	62 mg per cent.
Sulfaguanidine ..	3.4	63
Sulfapyridine ...	.17	1.6
Sulfadiazine	.077	.34
Sulfathiazole	.073	.35

Inoculum = 100,000 cells per ml.

However, when the effect of .04 M sulfanilamide on the respiration of resting cells of these organisms was compared, equal inhibition was obtained with both strains.

TABLE IV

EFFECT OF .04 M SULFANILAMIDE ON GLUCOSE RESPIRATION OF RESISTANT AND NON-RESISTANT *E. coli* IN M/60 PHOSPHATE BUFFER, PH 7.2 IN AIR

	Control Q_{O_2}	.04 M Sulfanilamide Q_{O_2}
Parent strain	61	52
Inhibition		15 per cent.
Resistant strain ..	69	58
Inhibition		16 per cent.

SUMMARY

These data indicate that the inhibition of bacterial respiration is not a suitable criterion for the presence or absence of true sulfonamide activity.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

MICROMETER BURETTE

THE microburette recently described by Scholander[1] in common with all other modifications of a Rehberg burette[2] can only be used with solutions that do not attack mercury. Burettes of this type get dirty quickly, probably because grease creeps along the mercury. They are also hard to clean. To avoid these difficulties, we have constructed and used a burette combining a micrometer with a syringe, as has been done in one imported microburette. The anvil of a micrometer is cut off and a glass syringe mounted on a simple clamp in line with the spindle. Rubber bands attached to two hooks near the knurled head of the micrometer and to the plunger hold the latter tight against the spindle. A delivery tube can be attached to the syringe with a No. 0 one-hole rubber stopper; or if necessary a broken syringe of the same glass can be drawn out and fused on to the orifice of the syringe. A brass washer should be cemented to the outer end of the plunger and accurately perpendicular to its axis to act as a thrust bearing against the spindle. This bearing should be oiled occasionally. A convenient support can be made by screwing the yoke of the micrometer to the boss of a universal burette clamp, which can then be attached to a ring stand. The clamps on the syringe should be lined with friction tape to protect the glass and prevent slippage. Extra clamps permit the use of syringes of different sizes. We have used a 1-inch micrometer which delivers about 0.4 cc from a 1 cc tuberculin syringe or 1.5 cc from a standard 2 cc syringe. The syringes can

[1] P. F. Scholander, SCIENCE, 95: 177, 1942.
[2] P. B. Rehberg, *Biochem. Jour.*, 19: 270, 1925.

easily be dismounted and cleaned and even sterilized if necessary, permitting the use of several solutions in the same burette. The micrometer burette can be conveniently calibrated by titrating a dilute base with

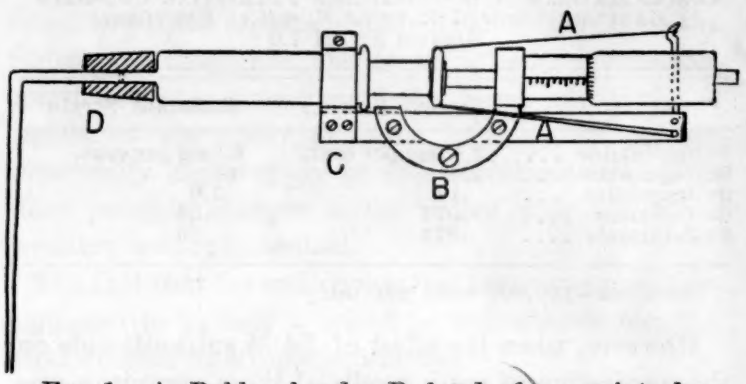

FIG. 1. A, Rubber bands; B, head of screw into boss of burette clamp; C, clamp around syringe barrel; D, rubber stopper.

constant boiling HCl. We have used cheap micrometers[3] and found linear calibrations to one part in 1,000 independent of the speed of delivery. The rest of our procedures did not warrant greater accuracy, but since some micrometers are accurate to 1 part in 10,000 and at least equal accuracy can be obtained with a Krogh syringe pipette,[4] the combination could doubtless be used with a corresponding accuracy.

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A STABLE HYDROGEN PEROXIDE AEROSOL

THE work of Twort and co-workers,[1] of others[2] as well as the recent work of Robertson[3] and his co-workers on the effect of propylene glycol aerosols on the decontamination of virus-infected air has led us to investigate the production and stability of hydrogen peroxide aerosols. Applying principles previously described[4] and using commercial nebulizers, hydrogen peroxide aerosols have readily been formed.

As described previously, the droplet vapor pressure was controlled by 50 per cent. glycerol. A solution of 0.1 per cent. hydrogen peroxide containing a stabilizing agent was nebulized at low pressure for forty-five minutes. During this time the weight decrease of the original solution was about 50 per cent. The hydrogen peroxide titre of the residual solution after nebulization was more than 0.1 per cent. (the original value) in spite of the fact that the solution was filled with bubbles resulting from the aeration. This increase in peroxide content following nebulization will be subsequently explained.

A stronger solution (3 per cent.) of hydrogen peroxide was vigorously nebulized in a closed room, $10 \times 10 \times 15$ feet, for forty-five minutes. The room was continuously filled with a fog produced by our technic of nebulization. Both normal and allergic individuals did not feel any discomfort or irritation while remaining in the room for as long as five minutes. Samples of the air were positive for peroxide. During the forty-five-minute period of nebulization, the volume of the solution decreased one half, but the peroxide content *increased* about 25 per cent. This increase in peroxide content was probably due to evaporation of water. In any event, it was surprising to find that the concentration of peroxide increased after nebulization. This makes the nebulization procedure practical. It is of interest that one may repeatedly breathe in dense mists of this concentration of peroxide without any irritation.

By inverting a two-liter bottle and forming a mist inside, the stability of a sample of a mist in this vessel was followed as well as the stability of the hydrogen peroxide droplets themselves. Potassium iodide starch papers were thrust quickly under the bottle at various intervals and the change in color followed. In this simple fashion it was found that hydrogen peroxide mists formed by nebulization show excellent peroxide activity (gaseous or droplet) for at least as long as one and one-half hours after the mist has been formed.

An investigation of additional biological and chemical properties of these stable hydrogen peroxide aerosols is in progress.

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[3] These can be obtained, for example, at Sears Roebuck and Company, or radio supply houses for about one dollar.

[4] A. Krogh. *Ind. and Eng. Chem. Anal. Ed.*, 7: 130, 1935.

[1] D. C. Twort, A. H. Baker, S. R. Finn and E. O. Powell, *Jour. Hyg. Camb.*, 40: 253, 1940.

[2] An excellent review of the literature: A. H. Baker, *Chem. Prod.*, January, 1941, p. 25.

[3] O. H. Robertson, C. G. Loosli, T. T. Puck, E. Bigg and B. F. Miller, SCIENCE, 94: 612, 1942.

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